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The Geographical Journal

Vol. LXIX No. 3 March 1927

THE FIORDS OF THE HEBRIDES

Professor J. W. Gregory, D.Sc., F.R.S.

Read at the Meeting of the Society, 20 December 1926.

THE surface of the Earth is furrowed by valleys of two kinds—those excavated by water, and those due to the rupture of the crust by earth-movements. The Scottish valleys include representatives of both types and display their characteristics especially well where the floors are occupied by the sea. The eastern coast is indented by great firths, which being drowned river valleys belong to the class of estuaries technically known as rias, from those in the north-west of Spain. Between the firths the coast extends in straight or gently curving lines, broken by only occasional inlets and bordered by a few insignificant islets. The western coast, on the other hand, is indented by many arms of the sea, and the land projects in long promontories and peninsulas, and is fringed by numerous islands. These Western Isles or Hebrides vary in size from mere rocks to mountainous islands such as Skye, and they skirt the whole western coast from Cape Wrath to Kintyre. These islands are indented by sea-lochs which have the essential characteristics of fiords, and across the Sea or Gulf of the Hebrides similar fiords intersect the mainland. The sea-lochs are the distinctive features in the geography of western Scotland. The eastern coast is bordered by plains on which are situated the chief towns and ports, and the long belts of sandy links. The western Highlands, on the other hand, are mountainous to the shore, and some of the highest Scottish peaks are familiar landmarks in the voyage along the coast, such as the range from Ben Nevis to Ben Cruachan and Ben Lui as seen from the Firth of Lorne, Ben Lomond from the Clyde, and the less familiar but equally impressive northern peaks, Ben Attow and Mam Soul from Loch Alsh, Ben Dearg from Loch Broom, and Ben More of Assynt from the North Minch. In the western Highlands the chief settlements are at the heads of the lochs or on deltas which have been built out by mountain torrents as at Ullapool. The contrast between the geographical conditions of the two coasts is shown by the distribution of the railways. Along the

eastern coast they run for great distances near the shore. On the western coast, north of the Clyde, the railways reach the coast-line only at the three terminal stations of Oban, Mallaig, and Loch Alsh.

The western coast of Scotland is a typical fiord coast. Its inlets

Lochs of Scotland.
Fresh water *Salt water*

show all the characteristics of fiords, though on a smaller scale than those of Norway. The longer of the Scottish lochs, such as Loch Fyne 45 miles, Loch Sunart 21 miles, and Loch Long 16 miles, are smaller than those of Norway, where Sogne Fiord is 112 miles long. The Norwegian fiords are also much deeper, the Sogne being about 4000 feet

deep, whereas the greatest known depth in a Scottish loch is 1017 feet in Loch Morar. The smaller size of the Scottish fiords is a natural consequence of the smaller scale of the country. The general length of the fiord coast from Cape Wrath to the Mull of Kintyre is only 250 miles, whereas the fiord coast of Norway is over 1200 miles long; the width of the fiord zone in Scotland is 40 miles against as much as 160 miles in Norway; its height in Scotland is mostly less than 3000 feet and seldom over 4000 feet, whereas in Norway there are extensive areas between 3000 and 8000 feet.

The contrast between the eastern and western coasts of Scotland is repeated in other fiord lands, as in that of Scandinavia, between the simple coast-line of Sweden and the fiords of Norway; in America between the fiord coasts of British Columbia and the even shores of Hudson Bay and between the Pacific and Atlantic coasts of Patagonia; and in New Zealand, where the fiords are opposite the smooth coast of Otago. The difference between the eastern and western coasts in Scotland cannot be explained by difference in the rocks, though this explanation was suggested by de Lapparent ('Leç. Géogr. Physiq.' (1907), p. 266); for the regular shores of Aberdeenshire and Kincardine are composed of the same kinds of rocks as the indented coast of Argyll. Neither can the difference be explained by the simple theory that the fiord valleys were dug out by glaciers; for glacial action must have been as powerful in eastern as in western Scotland; and the glacial theory of the origin of lake basins is inapplicable, because the fiord valleys and lochs of Scotland were pre-glacial. The ice naturally sometimes flowed along the lochs, but its movement was often across them, and by wearing away the upper parts of their sides it tended to destroy their characteristic features and alter the fiords into ordinary valleys. The independence of the glacial movement from the fiord valleys is shown by the three general glaciation maps of Scotland (A. Geikie, 'Scenery of Scotland' (1901), p. 306; Bartholomew's 'Survey Atlas of Scotland' (1912), p. 14; W. B. Wright, 'The Quaternary Ice Age' (1914), p. 49). The same fact is shown in detail for special areas by many maps; for example, for the area between the Firth of Lorne, Jura, Colonsay, Loch Fyne, and the Clyde, in the map in *Mem. Geol. Surv. Scotland*, No. 35, 1911, p. 61; and for Mull and the Firth of Lorne in *Mem. Geol. Surv. Scotland*, "Tertiary Geology Mull" (1924), p. 395, extended by Mr. J. F. Scott to Morvern.

The Hebridean Lochs as Fiords.—That some Hebridean sea-lochs are fiords is shown by their possessing five fiord characteristics. They agree, in the first place, in general form. These sea-lochs, like fiords, are arms of the sea which extend far inland between steep parallel-sided walls; their valleys occur in straight lengths and are flat-floored; they are therefore trough-shaped and are usually free of islands. Instead of the spurs from either side overlapping as in ordinary river-cut mountain

valleys, the spurs are truncated and often show a line of facets on each side of the valley.

Second, the lochs may be of surprising depth. This feature is less marked in the sea-lochs because their deepest hollows have been silted up; but Loch Morar, only 20 miles long, and now separated from the sea by a narrow barrier, reaches the depth of 987 feet below sea-level. The floor of Loch Ness sinks 701 feet, and that of Loch Lomond 599 feet below the sea.

Third, although deep within, most of the lochs have a shallow entrance, owing to the existence there of a rock ridge or threshold.* Of the thirty-three main sea-lochs on the western coast of the mainland of Scotland twenty-five have thresholds; and of the eight exceptions, some may only be apparent as the threshold may have been buried under sediment.

Fourth, as the fiords and fiord valleys subdivide inland, and usually at regular angles, and as the branches from adjacent systems often unite, the coast-land is broken up by a network of channels and deep valleys. Massive flat-topped angular blocks are left between valleys which are arranged like cracks in badly shrunk plaster and enamel, and not like the dichotomous branching of river and glacier valleys.

Fifth, the fiord districts are dissected plateaus. This feature is often not recognizable from the sea whence the land may appear an intricate maze of lochs and peaks; but from the mountain summits the peaks and ridges are seen to rise to the level of the former plateau, and in a dull light, when the valleys are indistinct, the country has the aspect of a wide gently undulating plain.

That many of the Scottish sea-lochs are fiords has been recognized in both technical and popular literature. For example, Herbertson ('Physiogr. Introd. to Geogr.' (1910), p. 39) described them as "typical fiords." Loch Long has been repeatedly identified as a fiord (as, for example, by Sir Archibald Geikie, 'Scenery of Scotland' (1901), p. 481; and by Goodchild). Loch Hourn is especially impressive from the height of its walls. Loch Seaforth in Lewis shows a combination of fiord characteristics in the straightness of its lower 8-mile reach, its steep parallel sides whence the land rises to peaks of 2622 feet to the west and 1874 feet to the east, its abrupt changes in direction and the T-shaped plan of its inner section.

The fiord valleys are generally continued by land valleys of the same character. The floor may be a low alluvial plain where the sea has been displaced by material washed down by the mountain torrents; but some of the prolongations are great straths, on the floors of which are long deep lochs. Loch Shiel, for example, though occupied by fresh water, shows all the characteristics of a fiord with its straight course and cut-off

* The threshold has been called a sill, but that term has long had a well-established use in geology and geography.

Lower Loch Seaforth, Lewis: a trough valley

Eaval and Loch Eport

Loch Erisort, Lewis: a gutter valley

Loch Boisdale: a fiard

spurs. It was once occupied by the sea, and it would be again converted into a sea-loch by a 40-feet rise of sea-level. The long narrow fiord-like freshwater lochs of Scotland, it should be remembered, are limited to the western side of the country, and are all west of a line passing southward from Inverness across Central Scotland. To the east of that line the only lochs are round pools like the Fifeshire Loch Leven. The picturesque fiord-like lochs, the basins of which have doubtless the same origin as those of the sea-lochs, are all in the western half of the country.

Fiards.—In addition to the fiords there are lochs of two other kinds. One group are fiards, which are so named from the examples on the coast of Sweden. They occur in areas of hard rock, and differ from fiords owing to the low level of the country beside them. Their shores are intensely sinuous and their surfaces are interrupted by many peninsulas and islets. They are intimately connected in origin with fiords, and most fiords would be converted into fiards by submergence; for as the higher parts of the fiord walls are most exposed to denudation they are frayed by branch valleys, gullies, and minor irregularities. Hence if the valley were filled with water to the upper level the ribbon-like band of water would widen out into an irregular sheet with fringed edges and many promontories and inlets. Fiards occur in Norway where the coast happens to be low-lying. They are present at similar positions in the Scottish coast, as at Loch Crinan at the western entrance to the Crinan Canal, around Arisaig on the coast north of Ardnamurchan, and in the Barra Islands and in Lewis among the Outer Hebrides.

Loch Boisdale: a fiard

Gutter-Valleys.—The third type of sea-loch has a broad and relatively shallow valley with gently sloping sides. These gutter-valleys include the Sound of Mull, which was probably initiated as an old land valley worn out by a river flowing from N.W. to S.E., and Loch Sunart, which was later, in places, betroughed. The main slopes rise in gentle denudation curves to the mountains of Mull on one side and of Morvern on the other. The valley has been deepened and modified by earth-movements, which in the north-western part of the Sound formed the long fault cliffs near Tobermory and to the S.E. of Loch Aline made the precipitous basalt cliffs of Innimore. These cliffs are so recent that a waterfall, in wet weather, leaps from the plateau into the harbour of Tobermory.

Distribution and Orientation.—The main problem in connection with the Fiords of the Hebrides is their origin, and the best clues are their distribution, their independence of the older grain of the country, and their relation to the major geographical features of North-Western Europe. This apparently intricate maze of waterways is based upon a simple plan. The fiords lie along four directions; the two chief series trend N.E. to S.W. and N.W. to S.E.; the two subordinate series trend E. to W. and N. to S. The rectilinear network formed by these four sets of valleys and geographical lines was pointed out in a diagrammatic

map of Scotland in 1913 (' The Origin and Nature of Fiords,' p. 156). This valley system is different from that of the repeatedly converging valleys of ordinary rivers and also, on a smaller scale, of glaciers. It is true that in some countries, where the streams have worked along planes

Tectonic Lines and Loch Basins.
E-W—— N-S+++ NE-SW..... NW-SE----
Four southern dykes showing their course the more easterly than south easterly as further north.

of weakness due to joints, the bends of the valleys are regular and rectangular; but I know of no case where such joint-controlled drainage has produced, either by rivers or glaciers, a rectilinear network of valleys with basins hundreds of feet below sea-level. It may be urged that the

fiord valleys are due to rivers and ice having enlarged the tectonic rifts by the removal of material which had been weakened by weathering along fractures. The ultimate problem would nevertheless remain, what made the fractures that gave the ice and water the power to excavate the network of fiord valleys?

The regularly arranged valleys due to denudation are dependent on the arrangement of the rocks, as is well shown in England and in the Southern Uplands of Scotland; whereas most of the fiord valleys cross the country utterly regardless of its fundamental geological structure.

The Hebridean Fiord Groups.—The Hebridean fiords may be divided into six groups in addition to two connected with the Firth of Clyde. That Firth is itself a ria, being the submerged western part of the Midland Valley of Scotland. The outer firth, a normal ria, presents a striking contrast to the trough-shaped fault-valley between the old rocks of Cowal to the west and the lava hills of Renfrewshire. The two parts are connected by the portal of the Inner Firth between Cumbrae and Bute. Still further north one branch of the valley continues across the Highland Boundary Fault as Loch Long, which, being deeply trenched and having its faceted spurs cut off along the same line, presents typical fiord characteristics. Further west other fiords indent southern Cowal along the Kyles of Bute, and the deep valleys which continue them inland often disappear northward in the mists of the Southern Highlands.

The second or Loch Fyne group begins to the south along a great fault which forms the eastern front of the peninsula of Kintyre and crosses Northern Arran. When seen down Loch Fyne from Ardrishaig, Arran takes its place as part of the south-western side of this fiord. At Ardrishaig the fiord turns abruptly to the north-east, and the south-eastern wall is so straight and smooth and with such a level edge where it joins the plateau, that it has the aspect of a colossal railway cutting. This type of scenery, which is widespread in the Scottish fiord valleys, is redeemed in interest by the variable and ever-attractive sea, and by the beauty of the atmospheric and colour effects. This even-walled upper part of Loch Fyne is roughly parallel with the strike of the rocks; but the loch is slightly oblique to the strike, and appears to have been formed along faults which though they followed the general grain of the country diverged from it in places. At Ardrishaig the loch turns at an elbow and it cuts boldly across the strike of the rocks. Loch Fyne—owing to the parallelism of its walls, its long straight edges, its angular changes of direction, the well-marked threshold at its mouth, and its independence in course of the structure of the adjacent country—has all the essential characteristics of a fiord.

The third group occurs along the western coast of Kintyre as far north as Loch Crinan; it includes the Sounds of Jura and Islay, and those between the adjacent islands. The larger sounds, such as those between Jura and Islay, are fault-formed; the fault along the north-

western coast of Jura is continued by the straight southern end of Shuna Island and by the fault that separates the two granite masses south of Loch Melfort. The geological structure of the Sound of Islay indicates its formation by parallel faults. The mainland opposite Jura is deeply indented by West Loch Tarbert, Lochs Killisport, Swin, and Crinan, which have very sinuous shores and are typical fiards. They indicate that the faulting of Jura Sound left Jura with a long straight scarp while the subsidence gave the mainland a drowned topography. These fiards and channels are pre-glacial, as most of them lie across the direction of the ice that flowed from the eastern mountains.

The fourth group consists of the Firth of Lorne and its continuation Loch Linnhe, and Strathmore, the valley and chain of lochs followed by the Caledonian Canal to Inverness. This valley is the longest fiord in Scotland. It lies along a north-east-trending fault, which is later than the youngest rocks along it. That the faulting is even later than the volcanic period is indicated by its relation to the basalt dykes. The country on the north-western side of the valley has been lowered by the fault movements; for the lochs and deep valleys which pass off to the west and north-west, including Lochs Eil, Arkaig, and Garry, and Glens Moriston and Lewiston—may be regarded as the estuaries of rivers from the north-western highlands. There is nothing on the eastern side, north of Loch Leven, to correspond to these lochs and valleys. The subsidence of the north-western side of Strathmore is also indicated by Mull, where the older rocks, which rise to the height of 2400 feet east of the Sound of Mull, are confined to relatively low levels and are now exposed in the foundation by some buried peaks.

The lochs of the fifth or Mull group are arranged partly in concentric and partly in radial series. The remains of three concentric series occur on the eastern side; but on the western side, owing to the wider submergence of the area between Mull and the outer islands, there is now but one broad channel. Of the circular series the innermost includes the outer part of Loch Sunart, its tributary Loch Teacuis, the fresh-water Loch Arienas, Upper Loch Aline, the fault band near Innimore, and in south-eastern Mull, Lochs Spelve and Buy, and on the western side the channels between Mull and the Treshnish Islands. The second concentric series includes the inner part of Loch Sunart, Loch Linnhe, the Firth of Lorne, and the channel between the Treshnish Isles and Coll. The outermost concentric series passes north of Ardnamurchan and through the Sound of Arisaig, is continued by Loch Ailort, Loch Eil, and Upper Loch Etive to Loch Awe, and goes by the pass from the head of Loch Awe to Craignish and so to the strait of Corrievreckan. These concentric series are traversed by radial fiords, some of which break the western coast of Mull into a trident of peninsulas; the northern coast is indented by Loch Cuan, and the eastern side by the conspicuous Glen Tulla; and farther afield the radial valleys are occupied by Lochs

Creran, Lower Loch Etive, and Loch Feochan. The arrangement of the Mull group is due to the volcanic activity, which strengthened the foundation of the island and therefore diverted the fractures from the normal course into a concentric peripheral series with some minor radial fractures.

The sixth or the Skye group agrees in general plan with that of Mull. The central mass of Skye was also the deep-seated core of an ancient volcano; and Skye is surrounded by a ring of peripheral sounds and lochs, including the Sound of Raasay, the Kyle of Loch Alsh, the Sound of Sleat, the Cuillin Sound to the south, and the Minch to the west. This series, like that of Mull, is broken by radial fractures including the famous Loch Coruisk on the southern side of the Cuillins, and the large lochs of western Skye, and on the mainland, upper Loch Torridon, Loch Kishorn, Loch Carron, Loch Alsh, and the magnificent fiords of Loch Duich, Loch Hourn, and Loch Nevis, which are opposite to south-eastern Skye.

The seventh series extends along the north-western coast of Scotland from Loch Torridon to Cape Wrath and for a little distance eastward along the Pentland Firth. On the western coast there are seven chief lochs which trend from W.N.W. to E.S.E., and four, with the upper part of another, which trend from E. to W. From the Pentland Firth four lochs run inland to S.S.E. This belt of Scotland includes the oldest of British rocks, and also a band of quartzite and limestone which is parallel to the general direction of the coast. The lochs cut across the grain of the country, which is indicated by the quartzite and limestone, at the angle of typically about 105°. The lochs from the Pentland Firth are approximately parallel to the strike of these rocks, and Loch Erribol lies along it. Some of the lochs, such as Loch Maree and part of Loch Ewe, and the lake, Loch More, occur on cross faults through the quartzite and limestone band. Basalt dykes, trending north and south, extend as far north as Loch Torridon; but further north none are known on the mainland though they occur in Lewis as far north as Stornoway. This group of lochs is therefore outside the area of the volcanic disturbance, and the lochs show one of the simplest expressions of the torsion fracture of western Scotland.

The eighth group is that of the Outer Hebrides, in the islands of Lewis–Harris, the Uists, and the Barra Isles. The loch series begins in the north with the broad valleys of Loch Erisort and Loch Resort, which with some intermediate fresh-water lakes form a broken line across Lewis trending approximately S. of W. to N. of E. South of this belt are the fiord valleys of lower Loch Seaforth and Loch Claidh, which trend from N.N.W. to S.S.E.; W. of them the mountains of the Forest of Harris are cut through by steep parallel-sided valleys, which are only not fiords as their floors are above sea-level. Further south in Harris the lochs trend N.W., as do the southern coast of the island and the geographical features in

North Uist around Loch Maddy. Then the course of the lochs and valleys lies E. to W., as seen in Loch Eport and Flodday Sound. Still further south the direction becomes W.N.W. in and on both sides of Benbecula. In South Uist a N.W. trend holds in the upper parts of Lochs Skiport, Eynort and Boisdale, and E. to W. in their lower parts. The sound between South Uist and the Barra group also lies E. and W.; but in the Barra Isles the directions W.N.W. to E.S.E. and W. to E. are both well developed.

The most remarkable feature in the fiords of the Outer Hebrides is that they cut right through the mountains. In Harris and South Lewis the upper part of Loch Seaforth once discharged along an E. to W. gutter-valley, but the drainage was diverted to the S.S.E. by the fractures through the mountains of Harris that made the middle and lower sections of Loch Seaforth. Similarly the mountain chain of South Uist has been broken through by Lochs Boisdale, and Eynort, which have diverted some of the western drainage to the Minch.

That the deep depression of the Minch was due to subsidence between faults was suggested by Sir Halford Mackinder ('Britain and the British Seas' (1902), p. 75). He remarked, "The suggestion is irresistible that the Minch is a submerged rift valley with collapsed floor, fault bounded." This view also has the support of Heddle, 'Geological Features of Outer Hebrides,' Harvie-Brown and Buckley, 'Vertebrate Fauna of the Outer Hebrides' (1888), p. 228.

That the Minch was thus formed is shown by various lines of evidence: for example, the lavas of western Skye slope upward till they end abruptly at steep cliffs, as if the rocks had been part of an arch of which the western side has foundered beneath the sea. Fractures connected with the formation of the Minch probably cut through the mountains to the west and formed the main sea-lochs of the Outer Hebrides.

The Orientation of the Fiords independent of the Geological Structure.—The orientation of the Hebridean fiords is not only remarkably regular, but is in the main independent of the older geological structure of western Scotland. In topography due to denudation the rocks which resist decay stand out as ridges and those which crumble more readily are cut down into valleys. The relief of a country is usually an expression of its structure. But in the western Highlands the fiord valleys cross the country regardless of the grain. The valleys are no doubt in places diverted along it, just as in the rupture of a piece of wood branch cracks tend to run for a short distance along the grain; but the direction of the Scottish fiords as a whole is quite independent of the fundamental structure. The dominant grain of north-western Scotland trends from N.N.E. to S.S.W., from Cape Wrath to Skye. The strike of the oldest rocks, the Lewisian gneiss, is almost at right angles to the other direction, being from W.N.W. to E.S.E. Some of the lochs, such as Loch Laxford, are approximately parallel to the Lewisian strike; but

where the grain of the country is determined by the younger sedimentary rocks the lochs cross it sometimes at right angles, and commonly at the angle of about 110°, as at Loch Broom. In the southern Highlands the usual grain of the country trends from W.S.W. to E.N.E. Some parts of upper Loch Fyne are approximately parallel to this direction, but in some places the two are oblique. The loch south of the right-angled bend near Ardrishaig cuts across the grain at an angle of about 116°. As the course of the fiords is not determined by the grain, the fiord-producing agency was so powerful that it cracked the country like a slab of glass, and was so recent in its action that many fiords are still bounded by straight scarps.

Tension-clefts.—The fractures associated with the fiords are of different sizes and patterns. They vary from mere cracks to wide passages, and from approximately parallel series with occasional bifurcations to widespread networks. Soft beds and weak rocks when crumpled yield by bending, whereas hard rocks yield by the opening of joints and the formation of tension clefts. In country folded into an arch the clefts are mostly long and parallel to the axis of the arch, though with perhaps some bifurcations at low angles. Around domes and basins most of the tension clefts are marginal and concentric to the centres of movement, and are crossed by others at right angles or at wide angles. Where a country has undergone torsion it is torn by intersecting diagonal fractures, and tension clefts of this kind are conspicuous in most fiord fields. They are shown in Greenland in a sketch by Kornerup (republished, 'Fiords' (1913), p. 266) showing the control of coastal outlines by joints. I have also reproduced (*ibid.* p. 101) a sketch by Brogger showing parallel clefts in the rocks of Norway, 50 miles west of Oslo (Christiania). Similar tension clefts may be seen in all parts of the western Scottish coast. They produce long straight gullies which cross the hillsides independently of the structure of the rocks; they sometimes give off branches at a regular angle, or are crossed by similarly arranged gullies. Some of these clefts break the rocks into large blocks by spaces which are broad above and taper downward. The smallest clefts are narrow joints, from which all stages can be traced through conspicuous clefts that are enlarged by the decay of the rocks, to gaps that at once admitted the local streams, and have been widened by their action. The clefts sometimes pass unbroken through different rocks, and are so crowded that they cannot be due, like ordinary joints, to a cause acting from within the rock; they are the result of some external wide-acting stress. In other places the clefts are less numerous, but broader, and they form passages wide enough for footpaths and roads.

Attention has often been called to the importance of the tension clefts in the development of Scottish topography.* The evidence is

* In some cases these clefts are due to weathering along dykes, along bands of weak rock, and along older joints. In many cases, however, clefts occur where there

most direct in the case of young narrow clefts such as some of the slocs and geos of the Outer Hebrides, which have been described by Prof. Jehu and Mr. Craig (*Trans. R. Soc. Edinb.*, 53, 1924, p. 421; 54, 1926, p. 469); also the goes of Caithness, and the gja or gjovs or geos of the Faroes, to which Dr. Peacock has called attention as showing the method of fiord formation in the Faroes.

Three Structural Types of Fiord Valleys.—The fiord valleys may be classified by the nature of the earth-movements that made them into three divisions. First, those due to the sinking of a strip of land between parallel faults, forming a rift valley, such as the Sounds of Sleat and Islay. Second, those due to the shattering of belts of rock by many tension clefts, and the removal of the broken material by wind, water, and ice. Kerrera Sound was thus formed, though it looks at first sight like a fault-bounded valley; but the cliffs beside it at Ardbane, south-west of Oban, are due to a tension scarp; for the evidence along the shore is conclusive that no major fault happened there, though the rocks are traversed by many minor faults with a throw of only a few inches. Some of the tension clefts beside Kerrera Sound have been filled by quartz veins and are seen in rock exposures at Oban. There is no absolute proof of the date of these quartz veins, but as they are parallel to the Sound they probably date from its formation. Similar young quartz veins parallel to the fault along the western side of Loch Fyne near Tarbert have been mapped by Mr. W. J. M'Callien.

The third type of fiord valley is due to the subsidence of a strip of country against one major fault, producing an asymmetric valley between a straight fault scarp on one side and a fiard coast with a fringed irregular shore-line on the side that has sunk. This type of tectonic valley is common among the Scottish lochs, as at Loch Linnhe and the Caledonian Canal, Loch Lomond, Loch Maree, and Loch Eport in North Uist. The Sound of Jura represents this type superposed on a rift valley owing to a renewed movement on the south-eastern side.

The Age of the Hebridean Fiord Valleys.—The determination of the cause of the fiords is complicated by the uncertainty as to their age, owing to the lack of fossiliferous rocks which would supply a time scale. In their absence the Scottish chronology of the latest or Kainozoic Era is dependent upon two great geographical revolutions—the first volcanic and the second glacial. The volcanic eruptions at Mull and Skye built up volcanoes as high as Etna, while later, in the glacial period, Scotland was covered by an ice-sheet even more complete than that of Greenland. The age of the eruptions is uncertain. The only fossil evidence from Scotland is from some plant beds in volcanic ash at Ardtun in Mull. The Geological Survey follows Mr. Starkie Gardner in regard-

are no dykes; they cut across the structural planes of the rock, and across the older joints. Such clefts have clearly been developed along fractures later than the volcanic period of Western Scotland.

Kerrera Sound

Loch Crinan and Scarba Fiard

Normal type of E.-W. valley with Loch Sunart in the old gutter valley

Morvern plateau with Loch Sunart in trough valley

Looking across Loch Linnhe to the wind-gap at the head of Loch Sunart in the E.-W. valley from Loch Tummel to Mull

ing them as Eocene and as possibly Lower Eocene. That view has the high though tentative support of Prof. Seward. The British Eocene climate was however tropical, as is shown by the palm groves that flourished in the London and Hampshire basins. The plants associated with the volcanic rocks in Mull indicate temperate conditions. The plant evidence is admittedly weak, for not one of the plant genera represented is distinctively Eocene, and an associated fossil beetle and a doubtful nut favour an age long after the Eocene. It is therefore likely that the original view of these plant beds being Miocene may be correct.

The last stage in the volcanic history was the injection of molten igneous rock into the cracks and fissures around the volcanic centres. This rock has solidified in dykes which are now conspicuous features in Hebridean scenery, for some of them stand out with the distinctness and regularity of artificial walls.

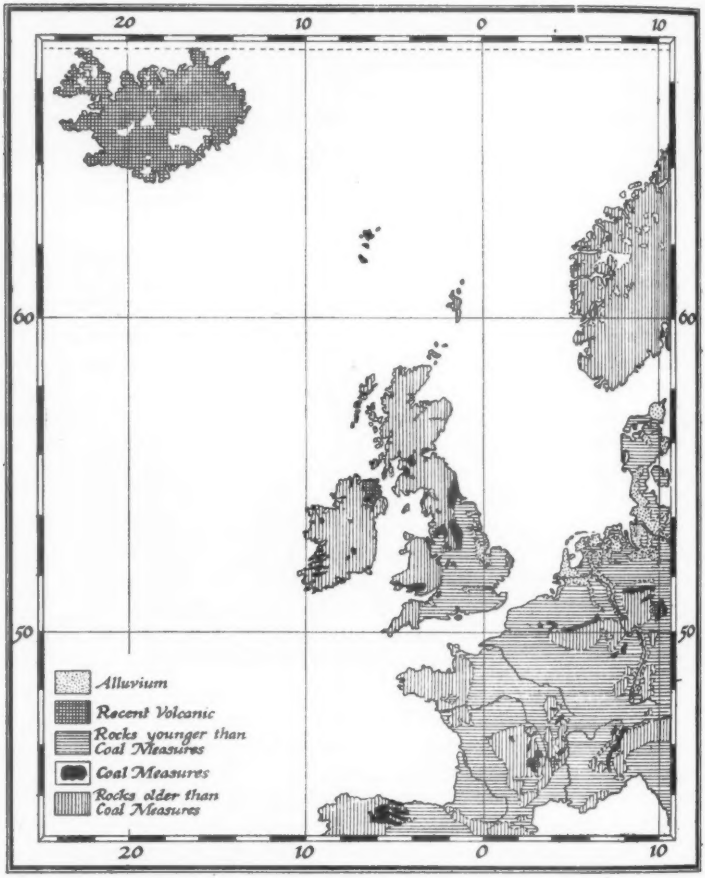
These dykes belong to two main series. Those of one series, as east of Oban, trend E. and W.; and they appear to be older than the members of the second series, most of which trend from N.W. to S.E. These north-westerly dykes occur in great swarms. One swarm passes through Mull and south of Oban. The dykes are sparser on both sides of this band (*Geol. Surv. Scotland*, Mull (1924), p. 357); but a second swarm with the same trend passes through Islay to Arran. A few of the dykes in the swarm of eastern Mull intersect the others at angles often seen in the intersection of the fiord valleys. Farther north, as near the Gairloch, the dykes of this series run N. and S.

To the N.E. of the swarms the dykes are less numerous, and none belonging to the volcanic period is marked on the Survey Maps on the mainland north of Loch Maree. In the Outer Hebrides, however, they occur in Lewis even farther to the north. The special significance of the dykes is that they show that the fiord valleys are later than the volcanic period, and are independent of the early systems of dislocations. The dykes are seen at sea-level and on the mountain-tops. If the valleys had been in existence when the dykes were injected the molten rock would have been discharged along the floors of the valleys and would not have reached the mountain summits. At the close of the volcanic period the surface of Scotland must have been above the level of the highest existing mountains.

The fiord valleys are therefore post-volcanic. They are also pre-glacial, for the ice filled them and like a vast vacuum cleaner scoured them and swept away all their loose material. The ice planed and smoothed the slopes of the valleys and cut back some of the spurs; but the valleys and major basins were all in existence before the ice flowed into them. The formation of the fiord valleys was therefore intermediate between the volcanic and glacial epochs.

Relation to the Alpine Folding and Atlantic Subsidence.—After the close of the volcanic eruptions Scotland was worn down into a plain

sloping gradually to the south and south-east. This plain continued across England and reached the sea in the southern districts, when the land was at least 600 feet lower than at present. According to Dr. Mort, the platform at the height of between 1000 and 1200 feet in Arran was sea-cut; and if so that part of Scotland was more than 1000 feet lower

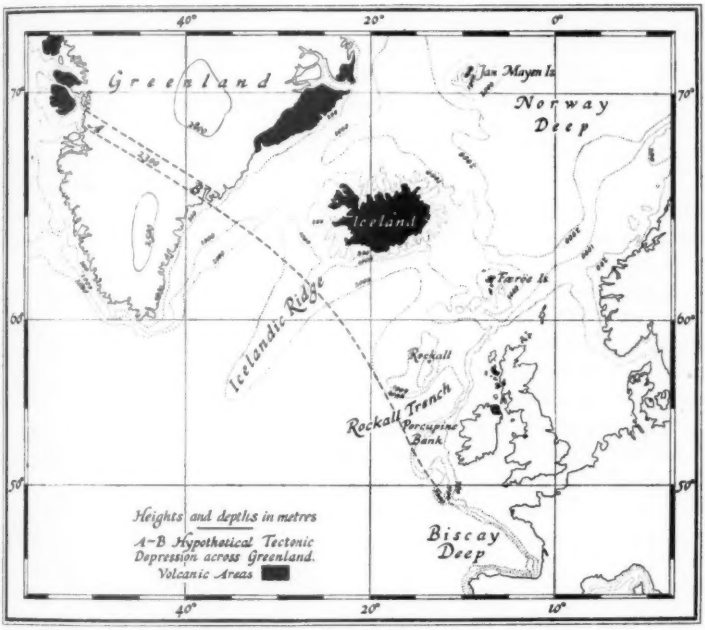


Geological sketch-map of Western Europe

than it is at present. Further north the old plain is from 1400 to 1600 feet above present sea-level, and represents an uplift of that amount.

The volcanic period found Scotland with various ranges and valleys trending E. and W. In the S.E. of Mull, for example, a ridge of gneiss with that trend was smothered by the volcanic eruptions. After the volcanic period many further ranges and valleys with the same trend

were formed and play an important part in the form and relief of the country, as through the northern Highlands the high ground occurs in long E. to W. plateaus separated by valleys. This later E. to W. relief was probably one of the secondary results of the Alpine movements. To the north of the intensely disturbed band which had been upheaved as the Alps and Pyrenees, a series of gentle crustal waves folded the country along lines trending E. and W. The movements not only affected the present area of Europe, but doubtless extended westward and there



Tectonic depressions in the North Atlantic

left the crust so unstable that the Atlantic was greatly enlarged and deepened by the subsidence of parts of western Europe and of the sea floor. Such subsidences are usually attended by volcanic activity, and the North Atlantic subsidences were associated with volcanic eruptions in Ireland, western Scotland, the Faroes, Iceland, and both sides of Greenland. The boundaries of the major subsidences are shown on the orobathymetric charts of the North Atlantic; and the steep slopes which bound the main deeps are parallel to the Hebridean fiords. The major slopes range N.W. to S.E. and N.E. to S.W., and two subordinate series trend the one E. and W. and the other N. and S. The subsidences which made these slopes inevitably produced planes of weakness in the adjacent lands.

The parallelism of the fiords and of the tectonic lines of the North Atlantic may be seen, to quote an easily accessible authority, from the bathymetric map of the North Atlantic basin, in the 'Times Atlas' (Plate II.), and in the figure herewith, prepared from the Prince of Monaco's 'Carte général bathymetrique des Océans.' One set of the oceanic structure lines trend E. to W., such as the southern slope of the Biscay deep, which was probably due to a subsidence on the northern side of the Pyrenean folds. The E. and W. lines in the British Isles include the arch of the Weald over the south-eastern counties, the uplift across Lancashire and Central Yorkshire which separates the South Yorkshire from the Northumberland and Durham coalfields, and farther north the southern shores of the Moray and Pentland Firths; also the numerous E. and W. straits between the Hebrides, and the valleys which have divided the highland plateau into many E. and W. bands.

The second lines run N. and S. One of them determines the western coast of Spain; west of Ireland this line is irregular, as it crosses the E. to W. structures, but farther north it is steep and straight where, as the western edge of the Vidal Bank, it forms the eastern side of the trench between Britain and Rockall. Meridional lines are also conspicuous on the western side of the Rockall Bank, and bound the Norway Deep in the Arctic basin between Iceland and Scandinavia. The British Isles rest on a shelf which sinks gradually to the depth of about 100 fathoms and is cut off to the west by the subsidence that made the trench between the Vidal Bank and Rockall.

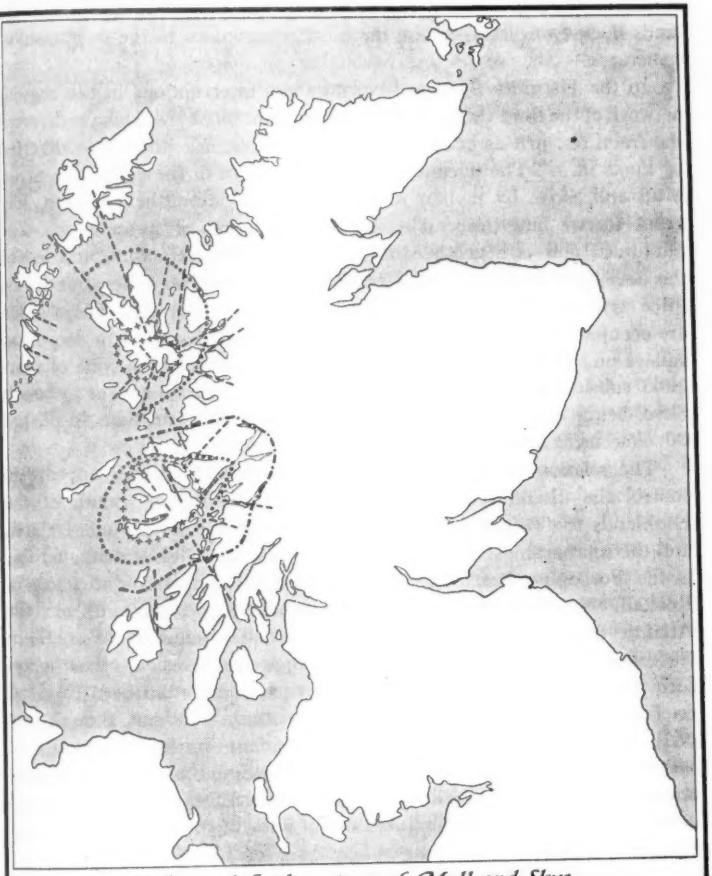
The subsidences at first ruptured long belts of western Scotland along close parallel lines, trending in the main from N.W. to S.E. These fractures happened during the closing stage of the volcanic period, and they were injected by molten basalt, and thus gave rise to the dyke swarms. The fractures were mostly parallel and were in strips of country that had been broken between faults. The parallelism of most of these dykes show that they were formed while the country was subject to widespread even tension.

The earlier of the Atlantic subsidences were bounded on one side by a N.W. to S.E. line from Greenland to the Bay of Biscay (Fig., p. 207); and along the parallel fractures in the land to the N.E., volcanic eruptions built up the volcanoes of Greenland, Iceland, the Faroes, the Hebrides, and Antrim. The last stage in this volcanic period was the injection of the dyke swarms; most of the dykes had a N.W. to S.E. trend, and a few of them reached as far south as the north of England. Later Atlantic subsidences on N.E. to S.W. lines broke up this volcanic belt, separated Iceland from the Faroes, and separated Rockall and the Faroes by the Faroe Trench and the Rockall Trench; and also formed and enlarged the Norway Deep to the east of Iceland and north of the British shelf.

The formation of these depressions to the north of Scotland on N.E.

to S.W. lines, while the foundations of the country were still weakened by the N.W. to S.E. fractures, altered the stress on Scotland from a simple bending on a N.W. to S.E. axis to a torsion along a N. to S. axis.

The torsion of a slab of glass, as is well known by Daubrée's ex-



Valley and Loch systems of Mull and Skye.

Inner concentric series ++++ *Second concentric series* ..... *Third concentric series of Mull* -.-.- *Radial series* ----

periments, produces intersecting cracks inclined 45° to the axis of torsion. The torsion of the Hebridean belt by the Atlantic subsidences would have produced two series of diagonal fractures, one trending N.W. to S.E. and the other N.E. to S.W. These two directions are the most widely developed in the Scottish fiords. The N.W. to S.E. lines also

occur throughout the north-eastern Atlantic, as in the northern boundary of the Biscayan Deep. The N.E. to S.W. lines bound the deep trench which runs from the Norway Deep between the Faroes and the Shetlands and the long rise which extends for 600 miles S.W. from the south-western corner of Iceland. In the Hebrides and throughout the Scottish Highlands these two directions are the most conspicuous in the geographical structures.

In the Hebrides there are however two interruptions in the regular network of the fiord valleys due to two resistant blocks which have diverted the fractures, just as cracks in a piece of wood are stopped or diverted by knots in it. The injection of the foundations of the volcanic centres, Mull and Skye, by molten rock material has strengthened them, like grout forced into the cracks in the foundation of a building. The reinforced masses beneath Mull and Skye resisted fracture, and led to the development around them of marginal concentric valleys, of which three series can be recognized around Mull, with some radial valleys which are occupied by the sea on the western side of Mull and form deep land valleys on the eastern. Skye is similarly surrounded by a zone of marginal subsidences with valleys radiating from it like spokes; though Skye, being nearer the margin of the Scottish platform than Mull, has the concentric series less well developed.

The relation of the British Isles to the Atlantic slopes appears to control the distribution of the later tectonic features. South of the Highlands the British platform projects westward far beyond Ireland, and the southernmost of volcanic areas, as Dr. Tyrrell has reminded me, is the Porcupine Bank 150 miles west of Ireland, and due south of Rockall. Southern Scotland and England being protected from the Atlantic movements by Ireland and the shelf around it, the southern fractures due to those movements change in direction. The dykes turn from their course to the S.E. till they pass across northern England on lines almost W. to E. Similarly in southern Scotland, though that N.E. to S.W. direction which is predominant in the topography of north-eastern Scotland still holds around the Sound of Jura, the greater strength of the E. to W. influence is there manifest by the westward curve of the Loch Tarbert in Jura, and of some of the lochs on the mainland and in Mull.

The sequence of events as interpreted in this paper is summarized in the following table:

SEQUENCE OF EVENTS IN THE FORMATION OF THE HEBRIDEAN FIORDS

Pleistocene.	Scottish glaciations and moulding of the pre-existing fiords.	
Upper and Middle Pliocene.	Uplift of the British Isles.	Formation of the fiords and the Scottish loch basins by diagonal and meridional fractures with fresh faulting. Formation of the later E. to W. valleys and geographical lines.

Lower Pliocene.	Subsidence below sea-level in southern England; extended Atlantic subsidences breaking up the volcanic belt of Iceland, the Faroes, and the Hebrides on N.E. to S.W. lines, producing torsion and diagonal fractures in Scottish area. Scotland subsequently reduced to a S.E. sloping plain.
Upper Miocene.	Subsidence in N.E. Atlantic on N.W. to S.E. lines, with volcanic eruptions on the border of the sinking area from the Hebrides to Iceland and Greenland. The volcanic period in the Hebrides closed with the dyke swarms, on N.W. to S.E. lines. Climate temperate, with fossils of Upper Kainozoic affinities.
Middle and Lower Miocene Oligocene.	Main Alpine and Pyrenean folding. British area continental and gently folded on E. to W. axes.
Eocene.	Climate in England tropical. Prolonged denudation o Scotland removing. before the volcanic eruptions, all but small patches of the once extensive Cretaceous deposits

The fiords of the Hebrides, like the sea-lochs and fresh-water lochs of western Scotland, may therefore be included among the indirect effects of the Alpine upheavals and Atlantic subsidences. The first stage in the development of these fiords was the folding of the country during the uplift of the Alps and the Pyrenees when Scotland must have been part of an extensive and continuous land, as the Scottish geographical features then produced were on parallel lines which trend E. and W. The compression due to this folding was followed by a reaction which led to the formation of tensional fractures and extensive subsidences in north-western Europe and the adjacent region to the west of it. These subsidences were accompanied or followed by volcanic eruptions and by the fracture of the country on lines which were predominantly from N.W. to S.E.; and as the subsidences approached the Scottish area it was weakened and subject to torsion along an axis aligned approximately N. and S. This twisting produced intersecting diagonal N.W. to S.E. and N.E. to S.W. fractures.

In the Pliocene period the British Isles were slowly uplifted. The uplift opened up the fractures and caused them to gape until they were wide enough to capture the drainage in the highlands and let in the sea on the lowlands. Surf along the shore and rivers and glaciers inland widened the clefts and valleys; and as they were made in the Pliocene they have inevitably been greatly modified by the ordinary geographical agencies; but the plan of the valleys, and the places where the fracturing led to the deep shattering and decay of the rocks and therefore to the formation of deep basins, were due to the combined effect of the Alpine disturbances and the enlargement of the North-Eastern Atlantic by the foundering of the adjacent land and of its floor. The fiords were therefore due to the rending of the crust during and after the Alpine earth-movements, and to the subsequent gaping of the fissures during the Pliocene uplift of the British area, which was probably three

times as great in Scotland as in southern England. The charm of the fiords as we see them to-day is due to the healing agencies of Nature, which have diversified and moulded into lines of beauty the straight scarps and featureless walls made by fault and fracture.

Before the paper the PRESIDENT (Dr. D. G. HOGARTH) said: Professor Gregory of Glasgow, and of many other places before that, is so well known to this Society and has either spoken to it or written to it on so many occasions that he needs no introduction from me. He is going to speak to-night about a region very much nearer home than those of which he has sometimes spoken before, but a region to which he has devoted a very great deal of care and attention. Those who were privileged to hear Professor Collet's paper in December last will realize what an immense interest attaches to the lake basins of Scotland as well as to the lake basins of Switzerland. I will now ask Professor Gregory to read his paper on the Fiords of the Hebrides. "The Hebrides," I may say, in this case is intended to include the fiords on both sides of the Hebridean Sea; that is to say, the fiords which run up into the west coast of Scotland as well as those which run up into the islands of the Hebrides.

Professor Gregory then read the paper printed above, and a discussion followed.

Sir JOHN FLETT (Director-General, Geological Survey of Great Britain): Professor Gregory's lecture is of intense interest to all who study the origin of British scenery and surface features. Perhaps his subject is one of the most controversial of all subjects concerning the development of British topography. The history of the fiords has been bitterly fought upon by Scottish and English geologists and geographers for more than sixty years, and, as I see by Professor Gregory's lecture, it is not yet by any means settled. Professor Gregory is an English geologist resident in Scotland. I am a Scottish geologist resident in London. Between the English and the Scotch on this subject of fiords there has always been, as we say in Scotland, "a bout." While I am prepared to accept a very great deal of what Professor Gregory has laid before you; to recognize that he has taken a broad and philosophic view of the subject of discussion, and to thank him for the manner in which he has placed the facts before us, yet there are certain points on which I crave permission to reserve my opinion.

Speaking generally, there are two methods of approaching this interesting little problem. One of these is to emphasize as far as possible the importance of Earth-movements and fractures, and I understand that Professor Gregory takes his stand upon that line: that he considers that Earth-movements, particularly of recent Tertiary times, have decided very largely not only the distribution but also the central features of Scottish landscape. The other line is, while admitting the importance of Earth-movements and lines of dislocation, to insist upon the immense importance of recent glacial erosion, so that the features of Scottish fiords are ascribed largely to the gnawing action of flowing glacial ice along lines of valleys which must have been pre-existent and which had an origin in the nature of the rocks in which they occur: to say that without ice you will not get fiords, and that the essential features of fiords are due to ice-action plus tectonic features.

While in close agreement with much that Professor Gregory has said, I would submit that fractures do not determine fiords. For the existence of fiords we need not only a definite system of volcanic fractures but a definite

cause of erosion, and that cause is partly running water, which decides the erosion of this system of fractures. For the ultimate configuration and sculpture of the fiords no agent seems to me to supply such effect as the action of flowing ice.

No one who studies the map of Scotland, and especially the West of Scotland, can doubt the reasonableness of Professor Gregory's main contention, that the lineaments, so to speak, of Scottish geography along that coast are very clearly defined by a series of fractures running in definite directions. We Scottish geologists who have been working patiently over the surface of Scotland year by year, mapping it sheet by sheet, recognize that there are at least four sets of fractures, each characterized more or less by its definite direction, and each set of fractures appearing to have been accompanied by a series of igneous intrusions in the form of dykes. On the north-west the pre-Torridonian; north-east, early Devonian, still moving in some cases; east and west, late Carboniferous; and north-west, Tertiary. All these, under certain circumstances, have been effective in the development of straight, steep-sided valleys and lochs. Some of the great fiords run north-west; some south-east, but the east-and-west fractures are not so pronounced as the north-west and south-east fractures.

Professor Gregory seemed inclined to ascribe to movements in Tertiary time the opening of the series of fissures along which erosion very rapidly took place, and suggested that by the submersion of these eroded valleys the present deep-sea fiords were formed. There is a great deal of truth in the contention, because in Skye and Rum and Mull we have those north-west lines of cracks deeply eroded, filled with water, forming fresh-water lakes or arms of the sea; and where there are arms of the sea formed there are typical fiords. There are in Mull a whole series of north-west fractures, many of them filled by igneous rock, and along these lines of fracture very deep lochs, eroded, so far as I can see, by glacial action. Where these lochs emerge upon the sea, fiords result. It seems to me from a study of that particular country that without glacial action there could be no fiords.

The characteristics of fiords, as Professor Gregory has stated, are their straight coast, their recticular arrangement, their great depth and vertical sides, and often also the presence of the sill or doorstep or threshold at their mouths over which the water in the interior may communicate with the water outside. All these features, except perhaps the doorstep, might be fairly well explained either by subsidence or by erosion along the lines of dislocation. But we have to remember that wherever fiords occur there is evidence of very intense glacial erosion, and that the great development of fiords in Scotland takes place in the district where the evidence is that the glaciation was most active and vigorous. We do not get fiords on the east side, but on the west. It would take too long to explain that now. Let me merely say that the watershed is near the centre; that for many reasons the glaciation of the west of Scotland has been more intense than on the east of the watershed and, although in some districts the fiords lay across the main lines of movement of the ice-sheet of the period of maximum glaciation, there is often proof that the deep valleys served as channels along which a current of ice flowed during a long time.

Professor Gregory has shown a map by which it is clear that the lines of the fiords in many cases are transverse to the lines of glacial travel. That is very true, but I do not think it is the whole truth. We geologists who have been working largely in the south-west of Scotland know that while the superficial ice frequently flowed over the surface, the deep valleys or troughs were filled with ice flowing along the deep channels, and where there is ice flowing freely in such channels there will be erosion, which will generally leave its mark.

Sir HALFORD MACKINDER: At this hour of the evening I do not propose to enter into a controversy, the first battle of which has been fought in your presence. We have already had an intimation from the Director of the Geological Survey that he does not regard the campaign as by any means over, and I have not the smallest doubt that when Professor Gregory comes to reply you will find that neither does he!

I would like to thank the Director of the Geological Survey for telling me a new fact, and that is that Professor Gregory is an Englishman. He is Professor of Geology at Glasgow, and I had always assumed that it would be very dangerous for an Englishman to profess the geology of Scotland in Glasgow! Further than that, I always assumed that he was a MacGregor who had dropped the "Mac." Really there is an omen in this. I am old enough to remember that once before an Englishman attacked the hierarchy of the Geological Survey in Scotland, and he came out victorious in the end. It was Professor Lapworth of Birmingham who fought a classical battle against the whole array of the Geological Survey, a battle on the question of the structure of the Highlands, and he won—an Englishman. I commend the case to the Director of the Geological Survey!

Professor Gregory was good enough just now to refer to some writing of mine twenty-five years ago. Several times in the course of those twenty-five years Professor Gregory has given me the very greatest pleasure by writing to me and telling me that now this and now that theory of mine had been substantiated by his detailed work, and this evening he has given me another instance. May I express a general geographical idea? When I first had to do with geography we youngsters were very much occupied with the question whether geography was a science or not, and we were very much occupied with fighting out the boundaries between geography and geology. We have all long since learnt that boundaries shift. But we have had this evening an illustration of the difference between them. To my mind, geography is not so much a science as a philosophy, an art, and a literature. Let me tell you my meaning by a musical analogy.

There is the bass of geology; there is the tenor of meteorology; there is the alto of agricultural, botanical, and zoological studies; and there is the treble of social, economic, and strategical studies. Now geography is a harmony of all four. This evening we have had a Gregorian chant sung by basses of the choir on the geological note. But, ladies and gentlemen, those surmises of mine to which Professor Gregory has referred were geographical; they were just due to looking, to gazing at the map. I was set the task as a young man of writing a book on the geography of the British Isles. There was vastly less definite knowledge available then than to-day, and one had to take the map just as one might take a musical score and try to read and hear its harmonies. There are some people who seem to be born with the love of a map in them, and there are others who seem absolutely incapable of getting any pleasure out of a map whatever. There are those who are born with geographical music in them, and there are those who will never, never attain to it. To my mind that is something which we, members of a geographical society, ought to remember in these days when the more daring stories of adventure are approaching their end. We have something which will last and last through all time: the innate and trained power of winning music from a landscape and from a map, and a music of full chords; not merely a tune sung by any one of the four voices.

I have ventured to refer to this matter to-night because Professor Gregory

brought to my mind that old study of mine. I knew a little bit here and there, but in the main I put forward ideas, due to gazing at the map by the hour together and trying to read its harmonies. It is a matter of the greatest delight that long years afterwards Professor Gregory, with all his authority, comes along and tells me that I was right in one or two of the ideas I launched. Well, there is more than pleasure, there is value in teaching this geographical music, because one of the roads to truth, in whatever sphere, is the road through harmony.

Dr. H. R. MILL: Professor Gregory always delights us, whether he is talking of the great Rift Valley of East Africa or of the little rift valleys of the west of Scotland. But on this occasion he has charmed me in a higher degree because he has rolled away at least forty years of my age and brought back the days of my youth when I sailed along those fiords month after month, summer and winter, carrying out investigations into their physical geography; and he has taken me back further, to the days of childhood amongst the goes and voes of that marvellous Caithness coast. We have heard of the magic charm of the West Highlands on many occasions; Professor Gregory has reminded us that that charm is deeper and older than Mary Rose, older than the Songs of the Hebrides, which have so often fascinated audiences in this hall; older and not less controverted than the Odes of Ossian; older, he dares to claim, than the Glacial Period itself.

I had stored up some smooth stones from the brooks of memory, but my old friend, Sir John Flett, has anticipated my bombardment with more authority and surer aim, and I bear him no grudge although he has eroded away the substance of the speech I might have made.

There are, however, still a few points which I should like to touch upon by way of criticism of Professor Gregory's paper, but they are points of a geographical rather than a geological nature. One is that I cannot wholly agree that the floors of the fiords in the west of Scotland are typically flat and trough-shaped. Most of those I have investigated are rather V-shaped in cross-section. The successive basins sometimes shown by a longitudinal section, separated from each other and from the sea by successive thresholds, have through their influence on tidal circulation a marked effect on changes of temperature of the water within them and on the life of the marine animals. These are matters the interest of which has been referred to several times before this Society and the facts in great detail are entomed, or perhaps entombed in the Transactions of other learned societies. I may refer those interested to the classification of the fiords and the lochs of the Clyde Sea Area which I made many years ago, and to the observations on that great shallow on the west of Scotland known in old days as the Vidal Bank, which is now recognized under the name of the Continental Shelf as part of one of the great features of terrestrial relief.

Professor J. W. GREGORY: It is impossible at this late hour to discuss all the points raised by various speakers and especially by Sir John Flett. I would only say that when I bear in mind the long controversy there has been between Glasgow and Edinburgh on this question of glacial erosion I am delighted to hear Sir John Flett admit so much.

I did not refer to the older fractures because it seems to me there is one simple test, provided by the dykes, which shows that all those older movements have had no direct effect upon the present fiords and lake basins in Scotland. Sir John Flett claimed that there can be no fiords without glaciers. One of the finest fiords in Europe is that at Cattaro, on the coast of the Adriatic, and

glacial action could have had no influence upon its formation. I quite agree that there has been some movement of the ice along the lower parts of the fiord valleys, even where the main movement of the ice was in a different direction. That shows that the valleys were there before the ice came into them, and therefore the glaciers cannot have made them. That the glaciers have had a certain effect by moulding and enlarging the valleys, I fully admit, but I am quite convinced that the main valleys were pre-glacial and therefore were not due to glacial action.

According to Sir John Flett, the ice-action was greater on the western side of Scotland. I personally think it was at least as great on the eastern side, because the greatest area in Scotland, above the height of 4000 feet, is on the eastern side. Though the Central Grampians have now a smaller rainfall, in the older times they would have had as great a snowfall as the western mountains. The abundant evidence of glacial action on the eastern side is accompanied by no fiords and no deep rock basins because the ice was acting upon an area which had not been ruptured by those great earth-movements which affected the west. I again thank Sir John Flett and you all.

The PRESIDENT: I am no geologist, but I am a man of a certain amount of circumspection, and I am certainly not going to put myself between Sir John Flett and Professor Gregory, who not only hurl about chunks of old red sandstone but apparently great blocks of millions of years! I beg to thank Professor Gregory and also Sir John Flett for having given us this very good discussion and having taught us such diverse things. It has been an excellent evening's entertainment, and I am sure you will express your appreciation to Professor Gregory for having initiated it.

SHIPS OF EARLY EXPLORERS

G. S. Laird Clowes

Read at the Afternoon Meeting of the Society, 17 *January* 1927.

IN dealing with the subject "Ships of Early Explorers," I must start by emphasizing two points: the first, common to the history of all early shipping, is what the geologists would call the imperfection of the record; the second is that explorers, from the Middle Ages at any rate right up to the present time, have normally employed small ships, and it is about the smaller craft of any period that detailed information is always least available. As to the imperfection of the record, it will be readily understood that to preserve through the ages the wood of which ships are built requires a combination of so many unusual circumstances as to make each preservation a veritable miracle. We have, in fact, one or two small Egyptian processional boats, two Roman vessels at the bottom of Lake Nemi—but not yet raised—a portion of a lighter of about 270 A.D. found in the Thames, a Frisian ship, two Viking ships; and these few examples, less than a dozen in all, can alone provide us with information as to the smaller details of shipbuilding over a period of about 3000 years.

In the British Isles, beyond the portion of a Roman lighter just mentioned and a number of dug-outs, whose age may perhaps be in no way commensurable with their primitive forms, we have a small royal barge of the reign of William and Mary, a large one of 1732, Nelson's *Victory* of 1765, with his funeral barge, and the *Implacable* of 1800; or, to put it more plainly, as far as the preservation of actual ships is concerned, from the time of the Romans until the seventeenth century the record is blank, and from the eighteenth century only two examples of big ships have been preserved for us.

There is also much imperfection in the pictorial representation of ships owing to the fact that they have at all times been most commonly represented broadside-on. Consequently it is extremely difficult to obtain any satisfactory idea of the real shape of early craft, and the more ancient models do not as a rule take us much further, for besides seldom giving much idea of the method of construction, they, in common with many representations in the flat, have frequently been greatly distorted in order to serve some particular purpose, either decorative or utilitarian.

With regard to the second point—the small size of the ships used by explorers—although from the sixteenth century, at any rate, we are all acquainted with the general appearance of the great " King's Ships " of England, the *Harry Grace à Dieu* and the *Sovereign of the Seas*, and, from 1660 onwards, the habit of making dockyard models has enabled many of us to know with considerable accuracy the details of the more important Royal ships, yet how many of us have any real idea of the appearance of the small traders of similar dates? And it was these small traders, in nearly every case, which carried the great explorers on their voyages to the ends of the Earth.

Of the more ancient civilizations, it is from Egypt alone that any detailed representations of ships remain to us, and I would therefore make a start from the expedition which the great Egyptian Queen Hatshepsut sent out to the land of Punt about 1600 B.C. The frescoes of her ships on her temple of Deir el Bahari are too well known to detain us long, but are so important as early detailed representations of sea-going ships that they repay considerable study. The construction, as may be seen from the model on the table, copied from a small funerary boat of rather earlier date in the Cairo Museum, is a skin of planks set edge to edge and connected together by a series of wooden ties, in the shape of double wedges, but built without stem, stern-post, keel, or any internal framing. A number of deck-beams stretch across the upper part of the vessel, but all necessary strength had to be supplied from the thin wooden skin. As a result, when it was desired to build large sea-going vessels for the voyage to Punt, now generally accepted as some part of the Somali coast, it became necessary—as had been done in much earlier Egyptian sea-going vessels—to add the trusses, which the fresco shows as stretching

from bow to stern of the vessel, supported by queen-posts along the central line.

I may mention that this same system of " hogging " trusses and queen-posts was developed in America some twenty-four centuries later and is now again to be seen in Egypt, in the more typical forms of modern Nile steamboat.

Queen Hatshepsut's vessels were propelled alternatively by oars or by a large square sail, which served however only when the wind was very favourable. A point which must not be forgotten in interpreting all pictures of Egyptian ships is that their beam was fully one quarter of their extreme length, so that vessels which appear so long and slender in the frescoes were really in form very much like the bowl of a modern spoon. Further, like most primitive artists, and in fact most artists up to the seventeenth century, the Egyptians habitually showed the water-line very much lower than it can possibly have been in actual fact.

Curiously enough, the vessels of the explorers of Greece and even of Rome present in many ways a more difficult problem than do those of the Egyptians. No Greek ships of any sort have been preserved, and we are thrown back on a number of carvings, in apparently correct proportion, representing disjointed parts of galleys, and some paintings in which strict proportion has not been maintained.

I have collected here photographs of the bow of a galley which serves as a support for " Victory of Samothrace " in the Louvre, the side of a trieres from a sculpture in Athens and the stern of a galley carved on a rock at Rhodes.

Assembled, they form a fairly concordant whole, but there remain many difficult points which they do not clear up. A very important question, structurally, is whether they were built with a keel—all we can say at present is that no indication of a keel can be found—yet it is hard to see how a vessel such as the Athenian trieres, whose normal length was nearly 150 feet, can have had reasonably longitudinal rigidity without either a keel or a " hogging " truss. There is also the more attractive question as to how the rowers were arranged in trieres and higher rates, but as the main reason for the multiplication of rowers was to obtain increased speed, we may safely assume that such vessels were not used for exploration voyages, and I would therefore only call attention to the solution recently put forward by Mr. Vihelm Marstrand, which appears to me the most practical yet advanced.

To turn now to a reproduction, from a cup at the British Museum, of a Greek galley and merchantman of about 500 B.C. ; the picture is instructive as showing the differences which had already developed between the fighting ships and the cargo-carriers, but as at that time all discoveries were strictly coast-wise and the early adventurers drew in to the shore nightly, galleys were the vessels employed. As long as the single square sail persisted the help of oars was most necessary, in order to combat

adverse winds, while the food and drink of the numerous rowers presented no insurmountable obstacle.

In Roman days the sails of the merchantman, as will be seen from a well-known carving from Ostia, had developed much further, and the additional sail on the "artemon," or bowsprit, must have greatly increased the power of manœuvre. Despite these improvements in sails, however, Roman exploration was carried out in the main by galleys, of which a fresco at Pompeii gives what is probably the best existing representation. It shows two long low vessels extraordinarily similar to the galleys which formed a great part of the Mediterranean navies right down to the end of the eighteenth century. Contrasted with a French galley of about 1700, these Roman galleys differ mainly in the form of the bow and in sails. The Romans had what would now be called a ram-bow, with the beak on the water-line, while the latter-day Mediterraneans employed an exaggerated clipper-bow, with the beak above water. One galley in the fresco has a primitive square sail, which could only have been used with a fair wind, hoisted on a very raking mast and obviously arranged for easy lowering when the vessel went into action.

If we now turn to the northern races we find that the art of shipbuilding, or perhaps it would be fairer to say the art of seamanship, had so far advanced that after discovering Iceland in the ninth century, the Vikings were able to make voyages thence to Greenland and even on to the American mainland. Fortunately there still exist in the Museum at Oslo two actual Viking ships which have been preserved almost intact from the ninth century. The Gokstad ship, the more interesting of the two from the point of view of discovery, represents just such a ship as that in which Eric the Red voyaged to Iceland about 1000 A.D., or in which his son Lief Ericson reached the shores of Vineland some years later. The ship was found in 1880, buried in a tumulus in Norway, and save for the higher portions of stem and stern-post very nearly complete. She is an open double-ended boat, built to most graceful lines with a deep rockered keel and considerable sheer. The length is 79 feet, breadth 16·5 feet and she pulled thirty-two oars and must have carried a crew of about seventy men. She was built as much to sail as to row, for each of the oar-ports could be closed by means of a small pivoted cover. Although she has few of the characteristics which we should now regard as suitable for stormy seas, boats of a very similar type were still employed on the northern coast of Norway, and smaller boats, on lines identical with the ancient ships, may still be seen in use in the Shetland Islands.

The Viking ships employed one large square sail set on a stout mast which was stepped amidships, and there is some evidence to suggest that they were able, by bracing the yard well forward, to sail with the wind on the beam, or even forward of the beam. A temporary hut with a

ridged roof could be erected amidships for the accommodation of the chief, and it is probable that at night, and especially when in harbour, an awning could be spread over nearly the whole length of the ship.

All indications go to prove that very similar ships were employed in the invasions of Britain by the Angles, the Saxons, and the Danes, and though a distinction is drawn by contemporary writers between the ships of King Alfred and those of his Danish enemies, it is hardly probable that it was much greater than that between the uniform and equipment of British and German soldiers of the Great War, a distinction obvious and important in the mind of a present-day historian, but entirely negligible if viewed from the standpoint of a thousand years hence.

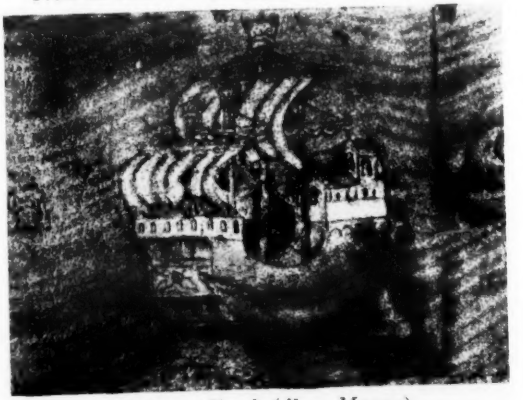
After the lives of the Norsemen became more settled, there is little indication of any improvement in naval architecture; in fact, what change there was seems to have been in the direction of broader and clumsier vessels. The ships depicted on the Bayeux tapestry differ little, save in diminished length, from those of the Vikings, and during the twelfth and thirteenth centuries, except in the Mediterranean, oars were largely discarded and a type of short broad cargo vessels became general on the Atlantic seaboard. These ships still had only one sail, and until well into the thirteenth century they retained the pointed stern, with a steering-paddle pivoted on the quarter, of the Viking vessels. There was need however for increased passenger accommodation, and soon after the introduction of the centre-line rudder, hung from the stern-post, the sterns became very much fuller so as to support a large summer-castle or after-castle. Concurrently a fore-castle was fitted in the bows to provide a commanding position for the fighting men.

Neither the ships nor the conditions of Europe during these disturbed centuries gave much impetus to exploration, and that maritime traffic of which we hear most from historians concerned itself with the transport of Crusading armies and their supplies through the length of the Mediterranean.

After this long period of little or no exploration comes the interesting time of Marco Polo's travels, between 1271 and 1295, when, owing to the conquests of the Mongols which broke down the religious seclusion of the Muhammadan races, the East was laid open for a time to European exploration.

In the Mediterranean, galleys propelled by oars were then the most common means of transport, but as by that period they were manned entirely by slaves, they were no longer suitable vessels for long voyages of exploration. With the ancient races, the Athenians at any rate, the galley crews were free-men and so could be trusted for long and arduous voyages, but no man in his senses would risk delivering himself, in unknown seas, into the hands of men whom the first accident would raise against him. As therefore galleys were then unsuited for explora-

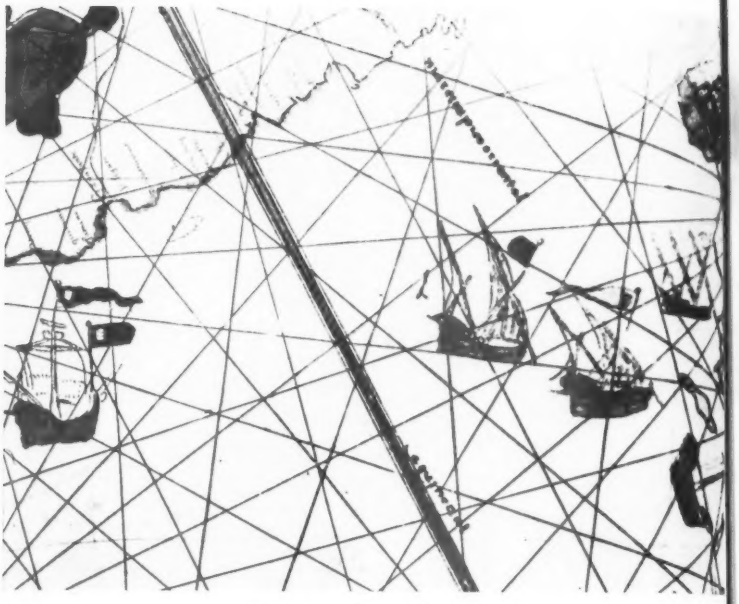
Chinese Junk in the Red Sea
From the Catalan Map, 1375, Bibl. Nationale, Paris



Chinese Junk (Fra Mauro)

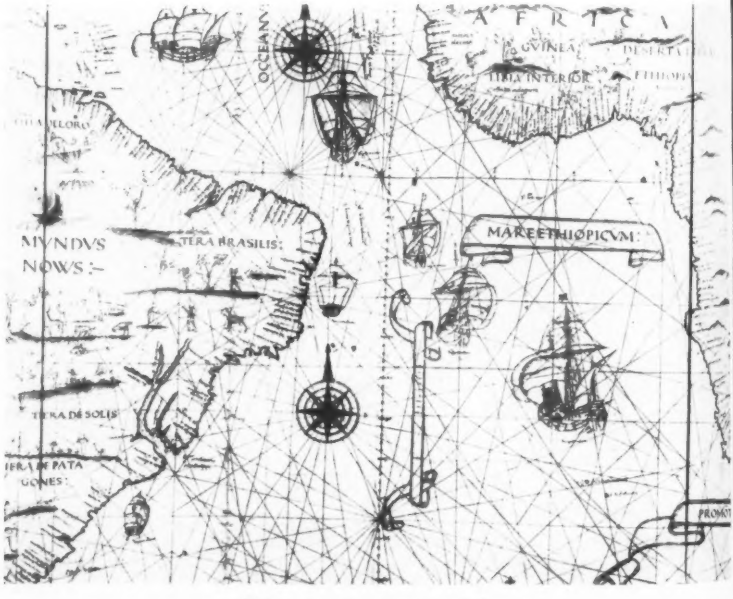
Ships round the British Isles

Ships off Arabia
From the Map of Fra Mauro, 1457, in the Bibl. Marciana, Venice



Ships in the Indian Ocean

From the map of Juan de La Cosa, 1500. *Madrid*



Ships in the South Atlantic

From the Map of Diego Ribero, 1529. *Collegio di Propaganda Fide, Rome*

tion, the interesting arrangement of the oars in these biremes, and in the triremes which succeeded them, need not detain us.

After the introduction of the triangular lateen sail into the Mediterranean, in the wake of the Arab conquerors—for the first known representation of a lateen sail dates from about 886 A.D.—some of these craft were rigged with two masts, and in 1191 we are told that Richard Cœur de Lion encountered and defeated a Saracen vessel with three masts; but the use of more than one mast did not at this period spread outside the Mediterranean nor did it extend to square-rigged craft. And indeed, inside the Mediterranean, the fashion of two-masted lateeners seems by the fourteenth century to have almost died out.

Only a comparatively small part of Marco Polo's travels were by ship, but he described the ships of Ormuz, in the Persian Gulf, and in very great detail the Chinese ships of the China and Indian seas.

The ships of Ormuz were undecked vessels, made without nails but sewn together with coir rope; they had one mast, and Polo notes that they had only one rudder, that is a rudder on the stern-post instead of two quarter-rudders, as was then common in the Mediterranean. This description would still fit almost exactly a number of present-day vessels from the Arabian Sea, and, save for the modern introduction of a small second mast and a line of dummy ports, may be illustrated by a model which only dates from about 1830.

Marco Polo emphasizes the comparative unseaworthiness of these vessels and contrasts them with the great size and strength of the Chinese junks, thus unintentionally explaining why the sea-borne trade, even as far west as the Persian Gulf, was in the hands of the Chinese.

In his well-known description of Chinese junks he mentions their great size, with as many as fifty or sixty cabins, their internal subdivision into water-tight compartments, and the fact that they were rigged with four permanent masts and two others which were sometimes stepped. He describes in fact, except for their diminished size, the Chinese junks of to-day, or at most a few years ago, with their four masts—fore, main, and two mizen, stepped side by side on the poop—and with a fore and a main topmast for use when winds were light.

Such descriptions have left their mark on the maps of succeeding centuries, for the Catalan Atlas, prepared by the order of Charles V. of France in 1375, shows in the Indian Ocean curious vessels with mat sails and a number of masts. The draughtsman however has made them a little difficult to recognize by coalescing all the sails into one large square sail, in order to make the vessels correspond with the ship with but a single square sail with which he was familiar in Europe. The row of square portholes should also be noted, for although a decoration of square dummy ports is typical of Chinese junks of a later period, and may in fact represent a survival of the windows of the many cabins referred to by Polo, yet no portholes were cut in the sides of any

European ships until they were required to accommodate cannon, at the beginning of the sixteenth century, more than one hundred years later.

Even more interesting are the vessels shown in Fra Mauro's Map of 1457, which is generally considered to be largely based on Marco Polo's travels. If we follow the coasts, travelling from Northern Europe, we find in Fra Mauro's Map first a number of one-masted vessels with a single square sail and with marked fore and after-castles, essentially similar to the reconstructed model of the thirteenth century shown on the table, except that by that time they had stern rudders. In the Mediterranean are a number of galleys and lateen-rigged vessels without forecastles, and none of them with more than one mast. In the Gulf of Guinea, the uttermost point of sea exploration of that period, is shown a two-masted vessel of rather uncertain type, but as soon as we have rounded what is now known as the Cape of Good Hope we fall in with a number of extraordinary lofty vessels with three or four masts and high after-castles. Both bow and stern are very square and highly decorated, and the rudder is shown as projecting below the stern, in a curiously detached position. I am unaware that any explanation of these craft has previously been attempted, but to my mind they represent with surprising accuracy the Chinese junks which Marco Polo describes as carrying the bulk of the trade of the Indian Seas.

If we compare them with the modern Chinese junk, the draughtsman's only error lies in his inability to understand the Chinese fore-and-aft sails, for he has represented in each junk a square sail of the type known to him in Europe, although where the yards are shown lowered their position is the same as in the modern Chinese vessels. Interspersed among the junks are a number of one-masted lateen-rigged vessels which only differ from those of the Mediterranean in their longer projecting sterns—and this is a characteristic which could be found in some Arab vessels right up to the middle of the nineteenth century.

I would direct particular attention to the multiple masts of the Chinese junks because, as shown on Fra Mauro's map, the vessels of Europe were then essentially one-masted, and although some two-masted ships had existed and probably still existed in the Mediterranean, European vessels of three masts were then not known, nor have we any record of them until 1466, nine years later than Fra Mauro's map. It was the introduction of the three-masted ship, with its improved ability to contend with adverse winds, which made possible the great voyages of discovery of the end of the fifteenth century, of Columbus to the West Indies, of Vasco da Gama to India, and of the Cabots to Newfoundland, and it is a curious thought that this great development may really have been due to the introduction into Europe of accounts of the multiple-masted Chinese junks which traded so effectively in the Indian Ocean. Far-fetched as this idea may seem to my audience, it is a fact that no one has yet been able to

explain satisfactorily the cause of the extraordinary and rapid development —in the course of only fifty years—of the one-masted vessel of 1450, able only to run before the wind, into the three or four-masted sailing ship of 1500, similar in all essential principles of rig to the three-masted ship of the seventeenth century.

To come now to the great age of discovery which opened with the voyages along the African coast made under the orders of Prince Henry the Navigator. These voyages started in 1418, and before the Prince's death in 1460 his captains had reached the mouth of the Gambia. Advance however was slow, and I think that ample reason may be found if we turn back to the contemporary map of Fra Mauro of 1457 and note that all the ships shown on the Atlantic seaboard were one-masters, and most of them fitted with the square sail which precluded progress against the wind.

As I have already said, the first known example of a three-masted ship dates only from 1466, but before the end of the century, with this advance to aid them, Christopher Columbus reached the West Indies, and Vasco da Gama, instead of stopping short like his predecessor, Bartholomeu Diaz, at the Cape of Good Hope, was able to round it and sail right on to India. Nothing is known as to the details of Diaz's ships, but from the date they may well have included, besides lateen-rigged carvels, square-rigged three-masters of a very primitive type, probably without any topsails and very similar to some of the Mediterranean craft illustrated in the later pages of the contemporary manuscript of the Pageant of the Earl of Warwick. By the time of Vasco da Gama however further development had taken place, and two of his vessels, the *S. Gabriel* and *S. Raphael*, of which a drawing made within fifty years of his return may be taken as a reasonable representation, were "naos," square-rigged with topsails on the main and foremasts and a spritsail under the bowsprit. The *Berrio* or *S. Miguel* was a lateen-rigged carvel, while the store-ship was probably partially square-rigged like a "caravela redonda." Da Gama's flagship was of nearly 200 tons burden and perhaps 85 feet long. Columbus's ships must have been very similar, but, curiously enough, despite the very numerous reconstructions of the famous *Santa Maria*, there is no reasonably contemporary reproduction of her or of any of her consorts. We know however that she was a "nao," square rigged, with a topsail on her mainmast only, that is, her sails were slightly more primitive than the drawing of da Gama's ships. Of his two carvels, Columbus converted the *Pinto* from fore-and-aft to square-rig for the purposes of the voyage.

Juan de la Cosa's map of 1500 contains excellent illustrations of vessels of this period. In the Indian Ocean we find a number of Portuguese vessels, carvels fore-and-aft rigged with two or three triangular lateen sails, and also one square-rigged "nao." We further find a curious

square-ended vessel with a high bow and stern which again suggests a Chinese junk ; but in this case, although the shape of the sail is fairly correct she has, unfortunately, only one mast.

On the American coast two Spanish square-rigged ships are depicted, but the artist, apparently more accustomed to carvels, rather slurs the distinction between square and fore-and-aft sails. I might mention that in the well-known picture of the departure of King Henry VIII. from Dover in 1520, to attend the Field of the Cloth of Gold, the same confusion occurs.

To come now to Magellan and his voyage through the Straits of Magellan and round the world, between 1519 and 1521 ; I fear that I must cast down an idol, for the representation of one of his ships, the *Victoria* of 85 tons, which forms the badge of the Hakluyt Society, is so well known to us. The drawing occurs in a map of the Pacific by Ortelius, dated 1589, but unfortunately one can only say of it, as one must say of the ships in quite a number of old maps, notably Martin Behaim's globe of 1492 and Mercator's Maps of 1554–1569, that such ships never were. The two-masted *Victoria* is really a terrible ship, partially mediæval, partially Roman, and totally impossible.

To take it out of your minds, I will pass on to the beautifully drawn ships contained in Diego Ribero's map of 1529, only eight years after the completion of Magellan's voyage. These are ships returning from the Moluccas, and show in perfect detail the condition of the arts of shipbuilding and of rigging at this period. Essentially they are three-masters similar to the larger ships of Vasco da Gama, but many interesting details are brought out, the wales and skids, or strengthening pieces along the sides of the ship, the square tuck at the stern, and the high forecastle with one large arch under it, as in ships at the end of the previous century. The sails show the very small and comparatively insignificant topsails on the mainmast and foremast, the great size of the main-course, which still remained the chief driving sail of the ship compared with the small fore-course only about seventy years old and still rudimentary, and particularly the two " bonnets," or more correctly the bonnet and drabler, fair-weather additions laced on below the main-course, in such a way that if the wind freshened, they could be instantly stripped. Holbein's picture of about 1532 is also of considerable interest as showing a near view of a very small vessel, only about 40 feet long and 15 tons burden, but rigged, as were practically all ocean-going vessels then and for long after, with three masts and square sails on the fore and main masts.

Turning now to the famous explorers of the end of the sixteenth century Frobisher, Drake, and the Dutchman Barents, once again the information available is of the slightest. Martin Frobisher's two ships, the *Gabriel* of 20 tons and the *Michael* of 25 tons, were so small as to be no larger than fishing-boats. Drake's *Pelican*, which in the course

of his voyage of circumnavigation he renamed the *Golden Hind*, was larger, with a burden of 150 tons; but even that will not allow for the high quarter-deck and poop and the four guns aside on a lower gun deck which are shown in the picture of the *Golden Hind* which decorates the border of Hondius's map of Drake's voyage. This map was published about 1595, fifteen years after his return, and is therefore a document on which our inclination is to rely as contemporary. The companion picture of the ship aground near the Celebes may give a slightly truer impression of her size, particularly if we take into consideration the floating cask near her, but I fear that even there the artist's enthusiasm has run away with him. She must really have been very much more like the small and much less lofty ship, about 73 feet long and of 145 tons burden, shown in one of the shipwright's drawings in 'Fragments of Ancient Shipwrightery,' a most important manuscript of a few years later, which is still preserved in the Pepysian Library at Cambridge.

When we remember that after Drake's return the *Golden Hind* was placed in a dock at Deptford and the dock was filled in with earth—very much as Nelson's *Victory* has recently found a permanent home in a dock at Portsmouth—and that for nearly one hundred years she formed one of the sights of London, it is indeed curious that no detailed representation of the first English ship to circumnavigate the world is left to us.

It is the smallness of the ships of the great explorers which defeated the artists, for to their minds their size ill befitted the great deeds that were done in them.

For Barents' vessels we are on safer ground, for the illustrations in de Veer's account of the adventures of the party in Novaya Zemlya, published the next year, give an excellent idea both of their ship and of the boats which they built after they had been compelled to leave their ship, and in which, after the death of Barents, they made the long voyage back from Novaya Zemlya to Amsterdam.

Ships, and even the small ships of explorers, were now beginning to approximate much more closely to the sailing ships of the late eighteenth century, with whose appearance we are all reasonably familiar. The *Sea-Hen*, in which, in 1642, Tasman discovered both Van Diemen's Land and New Zealand, cannot have differed much in appearance from the Dutch Flute which is depicted in an engraving of that period by Zeeman. The masts had by then become considerably longer, and the topsails were both longer and wider in the head, and in fact played a much more important part in propelling the ship than they did in the sixteenth century.

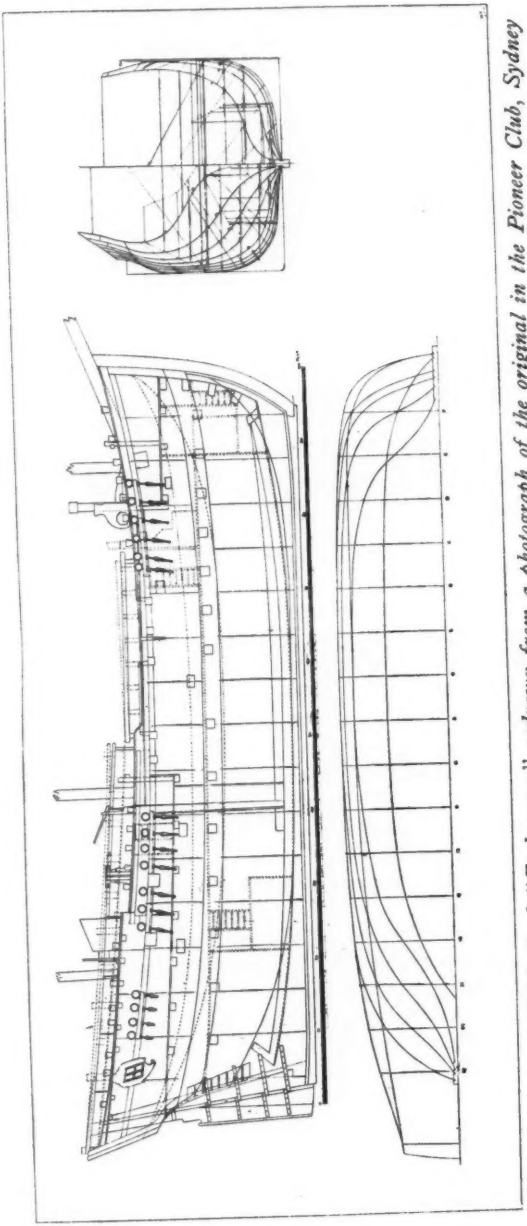
The *Cygnet*, in which Dampier made his voyage to Australia in 1688, and the *Roebuck*, in which he reached New Guinea in 1700 and which ultimately sank off the Island of Ascension, were both small merchantmen, bought for the occasion, and neither of them to be found in con-

temporary lists of the ships of the Royal Navy. A drawing of the *Mary Galley* of about 150 tons, which made the voyage to India in 1605, and from whose building specification and other papers it has been possible to make a fairly detailed reconstruction, gives a good idea of the type of vessel which he must have used, and this may be matched by an engraving of 1715, which shows a small merchant vessel off the London Custom House. It should be noted that while a square topsail on the mizen mast had been in regular use in the Navy for nearly a century, it was not yet employed in small merchantmen, nor had they ever taken to the spritsail topmast at the bowsprit-end, so typical of seventeenth-century men-of-war.

After the middle of the seventeenth century, however, we for the first time reach really firm ground, for we are able to find authentic, contemporary, and detailed representations of some of the ships of Captain James Cook.

His upbringing had been all in the coal trade, between the north-country ports and London, so it is not to be wondered at that, when in 1768 he was commissioned to prepare a ship for his first voyage, to observe the Transit of Venus, he turned to his home port of Whitby and selected the " cat-built " bark *Earl of Pembroke* of 366 tons, built at that port nearly four years before.

The collier barks of this period, the forerunners of the collier brigs of the nineteenth century, were stoutly built vessels, full in the body and bluff in the bows—excellent sea-boats and with plenty of space for the stowage of stores for Cook's long voyage, and with some room at any rate for the two scientists and other supernumeraries who accompanied him. We are fortunate—I may say most unexpectedly fortunate—in possessing the draught of the *Endeavour Bark*, as she was renamed, with a suffix to distinguish her from the existing King's ship *Endeavour*, which must have been made when she was taken over by the Admiralty. The draught, which is in possession of the Australian Pioneer Club, shows in dotted lines the alterations and additions made in order to suit her to her new service. The rails in the stern were raised and prolonged, a complete orlop deck was fitted on the existing beams, and also an athwartship forward bulkhead; four companion ladders were added in order to make the orlop and the hold more accessible, and a new galley—to provide cooking facilities for the increased crew—was fitted on the orlop deck. Collier barks were not then provided with figure-heads, and the absence of this very typical mark of a King's ship may very probably have been the cause of the inconsiderate treatment to which Cook was subjected at Rio de Janeiro on his outward voyage, where the Viceroy was unwilling to believe that the *Endeavour* was really a King's ship, and insisted on maintaining a guard over her all the time she lay in harbour. Small colliers of this period had still not adopted a square topsail on the mizen, but this sail seems to have been added, making the sail-plan of the



The draught of H.M. Bark "Endeavour," redrawn from a photograph of the original in the Pioneer Club, Sydney

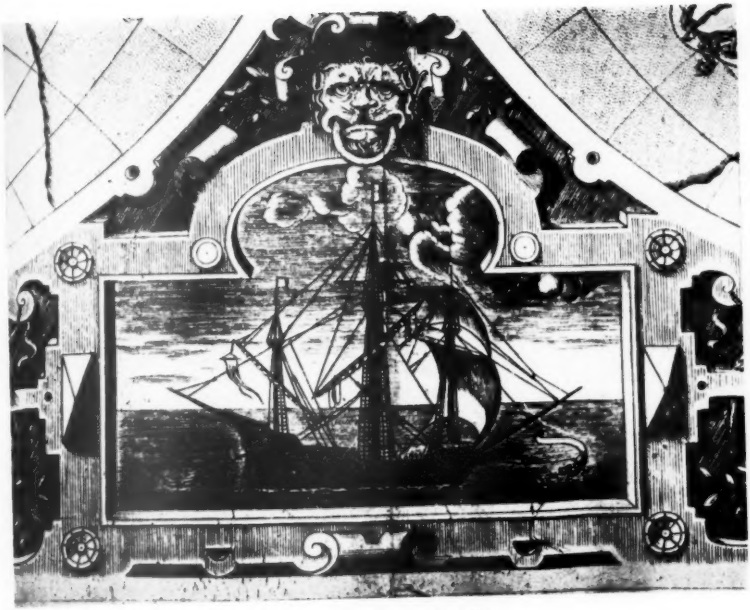
Endeavour exactly similar, save for the absence of royal sails, to that usual in small sloops-of-war. It can be realized from the plan that the accommodation afforded by this 100-foot vessel for the ten or more persons who berthed aft was of the scantiest description—the total cabin space was only about 45 feet long, with a height of 5 feet forward and 6 feet aft; but, on the other hand, we must not forget that the *Endeavour*, compared with the vessels of previous discoverers, was a large ship, for she was more than twice the size of Drake's *Golden Hind*.

For his second voyage of 1772–1776, Cook again had resource to Whitby colliers, although one of these he selected, named by the Admiralty *Resolution*, was 100 tons larger than his previous ship. An admirable contemporary painting of Cook's departure from the Thames on this expedition has recently come to light, and in consequence we again know considerably more of these ships than of those of any previous explorers. As a result apparently of the Rio de Janeiro incident, figure-heads were fitted to both ships—a sea-horse for the *Resolution* and some sort of nymph for the *Adventure*, but otherwise, except for the addition of rails and for the rigging, which was brought into line with man-of-war fashions, the *Adventure* seems to have remained almost unaltered. Cook's own ship, the *Resolution*, was fitted with a "coach" or "round house" aft, for the use of the commander, and her upper works were also raised by a foot. An attempt had been made to close in her waist with a spar deck, but she proved so crank that, in addition to reducing her lower masts by 2 feet, this deck had ultimately to be removed, with the result that Mr. Banks (afterwards Sir Joseph), wiser from his previous voyage, refused to put up again with such limited accommodation, and declined to sail with the vessel. He had previously tried to arrange for the employment of an East Indiaman or a 40-gun ship in place of the *Resolution*, but Cook strongly objected to any other type of ship being used.

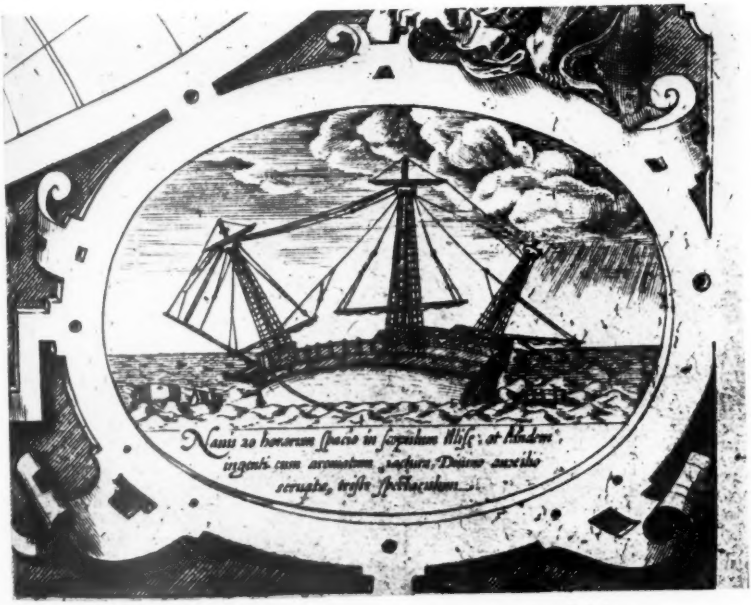
I may perhaps be allowed to add that, desirable as it is that this very historic picture of the *Resolution* and *Adventure* should be preserved in this country, the probabilities seem to be that it will leave us before long for Australia.

On his third and last voyage Cook again sailed in the *Resolution*, but the *Adventure* was replaced by the *Discovery*, another Whitby collier purchased specially for this work, but rather smaller than any of his previous ships. This vessel was again used by Vancouver in his voyage of exploration along the north-west coast of America. A contemporary print shows her as she lay aground for some ten hours in Queen Charlotte Sound in 1792. The little *Chatham Tender* of 131 tons, which accompanied her, was one of a class of four brig-rigged tenders built in the year 1788.

Considering the doubts and uncertainties of the earlier part of this paper, I am glad to have been able, before closing it, to point at last



The "Golden Hind"


Naues 20 horarum spacio in sexpedum illisse, at Hondius
ingenti cum admiratione lectura, Draconis auxilio
seruata, tristi spectaculum

The "Golden Hind" aground near the Celebes

From the map of Hondius: 'Vera Totius Expeditionis Nauticæ Descriptio D. Franc. Draci.' [Amsterdam? c. 1595?]

Cook's Ships, H.M.S. Resolution and Adventure, in the Downs before sailing on his second voyage, 1772

From the painting by Francis Holman in the possession of Mr. Francis Edwards

to one explorer, the great James Cook, about whose ships, despite numerous and popular misrepresentations, we have sufficient detail to make an accurate reconstruction possible.

In conclusion, I must express my thanks to Mr. Hinks, our Secretary, and to Mr. Heawood, our Librarian, for the great help and encouragement which they have given to me in the preparation of this paper, and particularly in obtaining photographs from some of the many interesting maps in the Society's Library; and also to my Chief, Colonel Sir Henry Lyons, who has allowed me to make such full use both of models and of lantern slides from other models and drawings which form part of the Ship-Model Collections at the Science Museum. The nautical collections there are rather heavily camouflaged under the title "Water Transport," and it is unfortunate that, although larger and of wider scope than any other in the Empire, they are so little known. The completion of the new galleries in Exhibition Road and the transference there, and consequent rearrangement, of the ship-models will, I hope, make the collections more familiar to that great section of the British people in which a love for things maritime is innate.

Additional Note on Cook's Ships, the "Resolution" and "Adventure"

By the kindness of Mr. Francis Edwards, the owner of the picture briefly referred to above, it has been placed on view in the Museum of the Society, and Mr. Laird Clowes has written the following note upon it, which should be read in comment on the reproduction opposite. A permanent photograph of the painting will be hung in the Smoking Room at Lowther Lodge.

This most interesting contemporary picture shows Cook's two ships in the Downs in 1772, at the start of his second voyage of discovery. It was painted by Francis Holman, an artist responsible for a good many of the portrait or "builder's" pictures of ships, so popular at that period, and in common with most of these pictures, it embodies in one group a broadside and a stern view of each ship shown. Many "builder's" pictures included a third view of the ship, bows on.

After a quiet country life of some 150 years, the picture was shown at the British Empire Exhibition at Wembley in 1924, but for some reason failed to attract any special attention, and it was not until it passed recently into the hands of Mr. Francis Edwards that its existence became known even to that small group of persons who are interested in the archæology of ships. To these it is of special importance, because in the place of the ordinary men-of-war of the period Cook employed for all three of his voyages Whitby-built collier barks specially purchased by the Admiralty and refitted for their destined purpose. Further, except for small and none too illuminating sketches, the only authentic draught of any of these ships previously known was that of the *Endeavour* bark, which is preserved at Sydney. The model of the *Resolution* at Whitby, reproductions of which have been published, and the drawing at the Royal Geographical Society, which have clearly both a common source, contain such obvious anachronisms and display so few of the known characteristics of the ship as to be worse than useless.

In the centre of the picture Cook's own ship, the *Resolution*, is shown,

broadside on and just about to drop her anchor. The main and mizen courses have been taken in and the crew are in the act of clewing up the fore course, while the main and fore topgallant yards have been lowered on to the caps, with their sails flying. Towards the stern, standing on the "coach" or "round-house" which was specially added at Deptford for his accommodation, is seen a figure which presumably represents Captain James Cook himself, with a telescope to his eye.

The rig of the *Resolution*, and also of the two other ships shown, is that typical of all small men-of-war of the period. The vessel has as figure-head a carved sea-horse, and she shows six guns in ports along her side. One or two of these guns, however, may well be due to artistic licence, as her main armament apparently consisted of twelve guns only.

On the right of the picture is a broadside view of the *Adventure* already at anchor and swung head to wind so that her partially furled sails have been taken aback. It can be seen that her refit was much less extensive than was that of the *Resolution*, and she retains in fact, except for her figure-head of a carved "Diana," her naval rig, and her six guns, all the characteristics of a collier. As a smaller ship of 336 tons, in contrast to the *Resolution's* 462 tons, she has a single window set flush in a "badge" on the quarter, in the place of the projecting quarter-gallery of the larger vessel, and her guns point over the rail instead of being placed in port-holes.

To the extreme left, both vessels are seen as they must have appeared a little later in the day, after they had got up their anchors and started on their voyage down channel, sailing on the starboard tack. Each ship carried her name painted under the stern windows, but while in the *Resolution* there are seven windows and projecting quarter-galleries, with the "coach" above, the *Adventure* has a much narrower stern with only four windows, the central panel being occupied by a carved female figure.

The small schooner-rigged yacht in the "foreground" is very typical of the period, and it should be possible, with some little heraldic research, to identify the brilliantly dressed figure of her owner, with his gold lace and red waistcoat, from the arms emblazoned on the blue flag at the stern—Argent, a bend sable, charged with three owls gardant, argent; crest, an owl gardant, argent.

Another three-masted ship, also shown in two positions, but in the far distance, bears on her stern the name "Scorpion." That she forms no part of Cook's expedition is shown by the fact that she is flying the blue ensign, while the explorer's two ships fly the red. If the name has been read aright, she must represent H.M. sloop-of-war *Scorpion*, of 16 guns, which was wrecked in North America in 1780, and which appears to be the same *Scorpion* as was built at Bewley in 1746. No explanation of the presence of this vessel in the Downs and of the reason for her inclusion in the picture has yet come to light.

Before the paper the PRESIDENT (Dr. D. G. HOGARTH) said: We are going to listen to Mr. Laird Clowes, who not only inherited a knowledge of ships but is the chief assistant of Sir Henry Lyons in the Marine Department of the Science Museum. He has therefore, for more than one reason, a unique knowledge of the construction and form of ships of the past. I believe that his original idea, when he proposed to speak to us this afternoon, was to concern himself mainly with the ships depicted on mediæval maps. I am not quite sure whether he desired to date the maps by the ships or the ships by the maps; but at any rate I understand that further research brought him to the con-

clusion that those ships are in many cases so conventionally represented or, at any rate, so much assimilated to ships which were known to the actual draughtsman of the map, that they were useless for either of his purposes, whichever had actually been his aim. Therefore he has changed his intention and is now going to give us an account of the ships in which the great explorations were done; the ships were astonishingly small, but the explorations, as you know, were fraught with the greatest results in their own time and for all time to come. I have no doubt that he will tell us a great deal which will add greatly to our knowledge, and also—which is more important—with very great authority.

Mr. Laird Clowes then read the paper printed above, and a discussion followed.

Sir HENRY LYONS (Director, Science Museum): I am afraid I can add very little to the real interest of the paper, because the subject is one of which I have no first-hand knowledge, but I should like to emphasize the point that Mr. Laird Clowes has made about the extremely scanty nature of the information. He has, as he told you, gleaned some from the old maps in the rooms of this Society; he has also endeavoured, I know, to find some further information in regard to the earlier Elizabethan ships in some West Country towns, but unsuccessfully. We should be very glad indeed to have the means of making one or two, even more, models of those earlier ships if only really reliable and technical information could be found anywhere. I am afraid the chance of finding any considerable amount of information is not very good, but it may exist somewhere, and if any one can help us to find earlier information we shall be grateful for the opportunity of using it.

Major EVAN FYERS (Member of Council of the Society for Nautical Research): We have listened, I am sure, with very great interest to Mr. Laird Clowes' lecture. He has really "surveyed mankind from China to Peru." I want to bring you back to Thebes, to that wonderful rock-cut temple of Queen Hatshepsut at Deir el Bahari with its wonderful paintings, including representations of ships, and one of which is said to show ships loading with all sorts of merchandise for that expedition to Punt, which I think has been ascribed by Maspero to somewhere in the neighbourhood of Cape Guardafui, a long way from Thebes. Those boats, whether they are there for merchandise for Punt, or whether they are intended, as was brought out by Admiral Ballard, for the transport of obelisks from Aswan down the river to Luxor, were very suitable for river navigation with its many shoals, shifting sands, and so on, but I cannot conceive of anything more unsuitable to take any goods round to Cape Guardafui or Somaliland. Perhaps the lecturer or some one else could tell me whether it has not been lately discovered that some of the earliest shipping, perhaps in the world, belonged to the Minoan Empire in Crete, and at any rate they preceded the nautical knowledge of the Phœnicians by several centuries. At the time when that expedition was projected Phœnicia was being conquered by the Egyptians, and it is a remarkable thing to remember that practically on and off for a thousand years Phœnicia was subjected to the Kings of Egypt, who thereby obtained the services of their deep-sea ships. Surely it would be much more reasonable to suppose that flat-bottomed ships, such as the one depicted at Deir el Bahari, would have navigated down the Nile, and the goods would have been transhipped to a sea-going ship and carried all the way round Africa. One can hardly imagine that they would have indulged in portage right across the Isthmus of Suez and then come all down the Red Sea. In 599 B.C. Ezekiel was carried off from his home in Jerusalem to Babylon, and

I would refer you to his description of the ships of Phœnicia of that time (Ezek. xxvii. 5), at the conclusion of which he gives details of the merchandise carried by the Phœnicians from all parts of the then known world.

As to the interesting slides that Mr. Laird Clowes has shown giving details, mostly from the ancient cartographers, of the ships of their time, I should like to mention the marvellous collection of Belgian and Flemish paintings now shown at Burlington House, in two or three of which are to be seen ships similar to those shown in the slides with which Mr. Laird Clowes illustrated the lecture.

Explorers did not always use merchantmen, particularly for Arctic exploration. When Captain Cook was away on his second expedition, which you will remember was to the Antarctic, we had another expedition going to the Arctic. In that expedition there were two ships, the *Race-horse* and the *Carcass*, which were selected because, being Bomb-vessels, their construction was more substantial than any others. Nelson served as a midshipman in the latter, whilst the commander of the expedition, Captain Phipps, was in the *Race-horse*. The *Race-horse* was 385 tons and the *Carcass* 309 tons, so that they were not very different in size from Captain Cook's ships.

Professor GEOFFREY CALLENDER: In his opening remarks Mr. Laird Clowes gave us a list of famous ships which were constructed more than a century ago, and which survive until to-day. I would like to add to his list one further name, that of the *Chaderqua*, a vessel said to have been 270 years old when she was moved in 1912 to her present position in a shed by the Golden Horn. She belongs to the Galley type, and presents some interesting features.

In the course of his remarks Mr. Laird Clowes marvelled, as I do, that no vestige was ever left of Drake's *Golden Hind*, though orders were given that she was to be laid up and preserved. The *Victory* is not, however, I am glad to say, being embedded in a dock; the restoration is being carried out in such a way as to render it possible for visitors to observe the under-water form of the ship and subsequently explore right under her keel, passing all round her.

I think that the lecturer was very successful in compressing into a brief hour's discourse a general view of the ships which were employed by the early explorers. There are, however, just two points on which I should like to touch—two points where the thread which ran through his argument seemed, if I may say so, to function with some difficulty.

In the first place, the lecturer seemed to me unduly to insulate the ships of the Viking age. In doing so he was doubtless following the fashion of those who have gone before; but I think that the time has come to work out the connection between the vessels built by the Vikings and the vessels of the Mediterranean. The Viking vessels—detached from the main trend of civilization—appear like mystery ships, arising out of nothing to astonish the world, and then sinking once more into oblivion.

The lecturer gave us an excellent picture of a Roman merchantman from the tablet at Ostia, which showed a vessel of heavy build. Yet on the score of sea-worthiness the Romans were astonished by the vessels of Northern Europe. Julius Cæsar describes for us the ships of the Veneti, and tells us that their sails were made, not of sail-cloth, but the skins of beasts. His comment is notable. The Veneti, he says, were probably not unfamiliar with sail-cloth, but used skins in preference because of the violence of the weather in the northern seas. The Roman Empire fell in the fifth century, and it might be supposed that all chance of communicating with the North of Europe passed away. As a matter

of fact, Justinian revived the Eastern Empire in the sixth century, and in the seventh and eighth centuries there was frequent communication not only between the east and west, but between the east and the extreme north-west, between the Ægean and the North Sea. My own belief is that there was a distinct connection between the Byzantine vessels and that development of northern craft which eventuated in the ships of the Vikings. I am not suggesting the substitution of Byzantine vessels for those of the Veneti. The blending of two types, I believe, produced a compromise or, if you like, a new offspring. The north did not discard their method of building vessels, but they adopted from Mediterranean civilizations the oared type of propulsion which made for rapidity of transit in the East, and made, of course, for rapidity in the forays of Viking marauders. The lecturer showed well how important oared vessels were to the trade of early civilizations; and if the Vikings had been cast in a different mould, they might have carried on a torch kindled by Byzantine trade, and the culture which trade engenders. Unhappily, they were destroyers rather than creators, and I cannot believe that they evolved the noble vessels by which they are now chiefly remembered. Hitherto there has been, I admit, little enough encouragement to bridge the gulf that separates the civilization of the Levant from the barbarism of eighth-century Scandinavia. Yet archæological researches are unearthing Byzantine coins along the North Sea coasts; and the same lines of inquiry are showing that when, in the ninth century, the Byzantines were excluded from the Western Mediterranean altogether by the Moslem conquest of Sicily, they forced new routes to the Baltic by the great river-ways of Russia, and by a great trunk-line that traversed the Adriatic and the Rhine. The growth of Venice is inexplicable until it is remembered that she played for Constantinople the same part that Marseilles played in the days of Imperial Rome. Students of Church architecture will not need to be reminded how Byzantine architecture got into France in the age of Charlemagne, and there does not seem much cause for astonishment if Byzantine naval architecture gave the Vikings their ideas.

The compromise between the ships of north and south, which enabled the Vikings to evolve their peculiar craft and traverse the seas from Egypt to America, brings me to my second point. I feel quite unable to support the lecturer in his contention that the wonderful development made by European ships in the fifteenth century is traceable to the direct influence of the Chinese junk. Mr. Laird Clowes has shown in words and in pictures how the mediæval ships that succeeded to those of the Viking age were beamier vessels, approximating, one may think, more nearly to the type described by Cæsar. The one-masted "round vessel" of Northern Europe in the thirteenth and fourteenth centuries is familiar enough to all students of sailing ships. How came it that they developed in the fifteenth century to the three-masted type which took Columbus to America and da Gama to India? That is the riddle to which the lecturer has given a Chinese answer. I for one cannot accept it. I believe the typical vessel of the late fifteenth century was, like her Viking predecessor, a compromise. It is impossible to prove this contention by archæological evidence. Mr. Laird Clowes has demonstrated the paucity of authentic remains. But history does come to the help of archæological research, and we do know that at the beginning of the fourteenth century the tables had been turned and the ships of Northern Europe were invading the Mediterranean. They came as pirates and they instantly asserted their superiority. As Mr. Laird Clowes has shown, Richard Lion Heart encountered a three-decker in the Levant at the time of the third crusade. It is practically certain that this

vessel was lateen-rigged throughout. In the Eastern Mediterranean lateen was still the fashion when the northern ships made their appearance. The northern ships brought a new sail-plan which the cities of the Western Mediterranean, Genoa and Pisa for example, were quick to adopt as soon as they had made due trial of its efficacy. But there was no case of substitution any more than in the evolution of the Viking ship. The Mediterranean states were convinced of the superiority of their hulls, and while they gave grudging admiration to the square sails and the seamanship of those who worked them, they had also for unnumbered centuries found the lateen sail sufficient. The clash of types, as was natural enough, again resulted in a compromise. The hulls henceforth were to be carvel-built after the immemorial custom of the south, and a lateen sail on the mizzen (or mizzens) assisted the vessel to answer her helm. On the other hand, the motive power or the driving power was henceforth provided—not by the balanced lugsails of Chinese craft—but by the square rig and the sail-plan of Northern Europe. In this way, I believe, was evolved the occidental ship of the fifteenth century without which the world would never have been explored.

The PRESIDENT: Mr. Heawood, the Librarian of the Society, has gone, or he would have spoken with great authority on the map ships. We have had an interesting lecture and discussion, and I would only touch upon one or two points. Major Fyers mentioned Minoan shipping, and I have some personal qualification for referring to that. So far as I know, there is no representation on any Minoan object of a ship which could possibly have been a sea-going vessel before the first Late Minoan period, and that, of course, is as late as, probably posterior to, Queen Hatshepsut. Minoan shipping, then, would not have priority over eighteenth-Dynasty shipping. With regard to the latter I have also some personal reason to know Deir el Bahari. I do not think it has ever been supposed that the ships were dragged overland to any port on the Red Sea, and there is no reason to suppose that there was any canal connecting the Red Sea and the Nile, such as was made at a later time. It is most likely that these ships of Queen Hatshepsut were built at some port upon the Red Sea, and that transport was effected from Thebes overland to the ships. However, it is extremely uncertain, whatever Maspero may have said, where Punt was, whether on the Somali coast or on the Arabian, or whether it was upon the outer sea at all. I quite agree with Major Fyers that the ships, as shown upon the walls at Deir el Bahari seem very unfit for ocean-going. They look as if they were built for river transit. What Mr. Laird Clowes said about Viking and other ships well illustrated the different ideas that existed even as late as mediæval times about what could venture on to the open sea and what not, but it has always to be remembered that a number of Nilotic river-boats during the Great War went round to the Persian Gulf, where they were wanted on emergency. I believe they all got there, which is an amazing thing. This was certainly one of the most curious features and side-shows of the war.

There is one other point on which I was most interested. Mr. Laird Clowes spoke of Fra Mauro's map, which was made in Venice. Although forty years had still to pass before Vasco da Gama rounded the Cape, that map shows a most life-like representation of the Cape. It has always been a puzzle how it was done, but I have no doubt that the general explanation is that the Venetians, venturing eastward into the Red Sea, while the Portuguese went down the other side of Africa, came into very intimate touch with both the Arabs and, what is new to me, possibly with the Chinese—I have to thank

Mr. Laird Clowes for that—and that Fra Mauro's accurate delineation of the east coast of Africa and the map including the island of Madagascar, of which Vasco da Gama was ignorant, and which he missed when he went up the coast and struck across to India, is due to communications between the Venetians and the Arabs, if not the Chinese. Certainly those illustrations which Mr. Laird Clowes put upon the screen seem to show that there were both Arab ships of the Mediterranean type, at any rate the Red Sea type, down in those southern waters and also ships of much heavier type differently rigged and with fore-and-aft castles, which may or may not have been China-built. However, I must not attempt to give a second lecture on a subject, however interesting, which was treated so admirably by Mr. Laird Clowes. I must ask you to express your gratitude for what has been a most careful and interesting paper, very much enhanced by the beautiful models Mr. Laird Clowes has been allowed through his official position to bring here, and for a near sight of which, not through the glass of a show-case, I am sure we are all exceedingly grateful. I beg to offer him your thanks.

A PERIPLUS OF THE PERSIAN GULF

Lieut.-Col. Sir Arnold Wilson, K.C.I.E., D.S.O.

Read at the Meeting of the Society, 10 *January* 1927.

I HAVE nothing new to say regarding the Persian Gulf: I have not broken fresh ground, nor explored untrodden wastes, nor can I add anything to the world's stock of knowledge. To reshuffle knowledge is rarely to increase it, and I should have been glad to use my own observations more and that of others less. "It is, however, not necessary"—to quote Doctor Johnson—"that a man should forbear to write till he has discovered some truth unknown before; he may be sufficiently useful, by only diversifying the surface of knowledge, and luring the mind by a new appearance to a second view of those beauties which it had passed over inattentively before."

In that spirit I address you, and in that spirit I ask you to follow me in the wake of Sindbad the Sailor, whose narratives,written in the ninth century, are part of the stock-in-trade of every well-conducted nursery. For there are beauties in "the Gulf," as I shall call it hereafter, not only of scenery but of animal life also, by sea and by land; nor are the people on its shores unworthy of admiration. Above all, its history is of absorbing interest to us. There is not an island, not a port, not a tract of water in the Gulf that does not recall some gallant or tragic incident in British annals. On Qishm Island, for example, lies William Baffin, discoverer of Baffin's Bay; at Hormuz and Bandar Abbas, Basidu and Bushire, and in a multitude of smaller ports on both sides, lie buried representatives of twenty generations of seamen and soldiers, British and Indian, and the bones of merchants not a few. I need not, therefore, offer any apology if I seem to refer at times less to the geography than to the history of a region in which I have spent some

fifteen years, and which has exercised over me a fascination which only those can understand who have lived for many years in primitive lands among ancient peoples.

The geological history of the Gulf may be said to begin in late Secondary times, when the Zagros range on one side and on the other the great plateau of Arabia rose out of the Cretaceous Sea. But Oman is really far older than this, for in those far-off timeless days the southern part of Arabia had already emerged from the waters that covered the face of the Earth: those blackened windswept countries have been land since land began. They are older than anything in Eastern seas, except the high places of Dravidia; no water has ever covered them; the sun has held and still holds unchallenged dominion over them. At first the Musandam *massif* separated the Gulf of Oman and "the Indian Ocean" from the Persian Gulf proper, which was connected with "the Mediterranean." In Miocene times the plateau of Arabia was elevated, and the Persian Gulf became an inland lake. After untold ages, still in the Miocene period, further violent movements took place; the Musandam promonitory sank, and admitted to the Gulf the waters of the Eastern ocean. Ages passed, and man began to appear—the Hamitic peoples entered from Africa, the Dravidians, perhaps, pushed along the Baluchistan coast; from the north, at a much later date, came Aryan races, whilst Semitic tribes occupied the western and northern shores. But they were colonists rather than conquerors.

The very earliest records we possess of human activities in this region relate to commerce. The British Museum has a tablet from Ur of the Chaldees, near the present Basra, dated about 2000 B.C., which records the arrival by sea at Ur from Dilmun—which may or may not be Bahrain—of copper, wood of various kinds, diorite, and pearls. Dhufar, an outlying province of Oman, was the oldest and perhaps the most productive of the frankincense districts of Arabia, to which Milton refers when he writes:

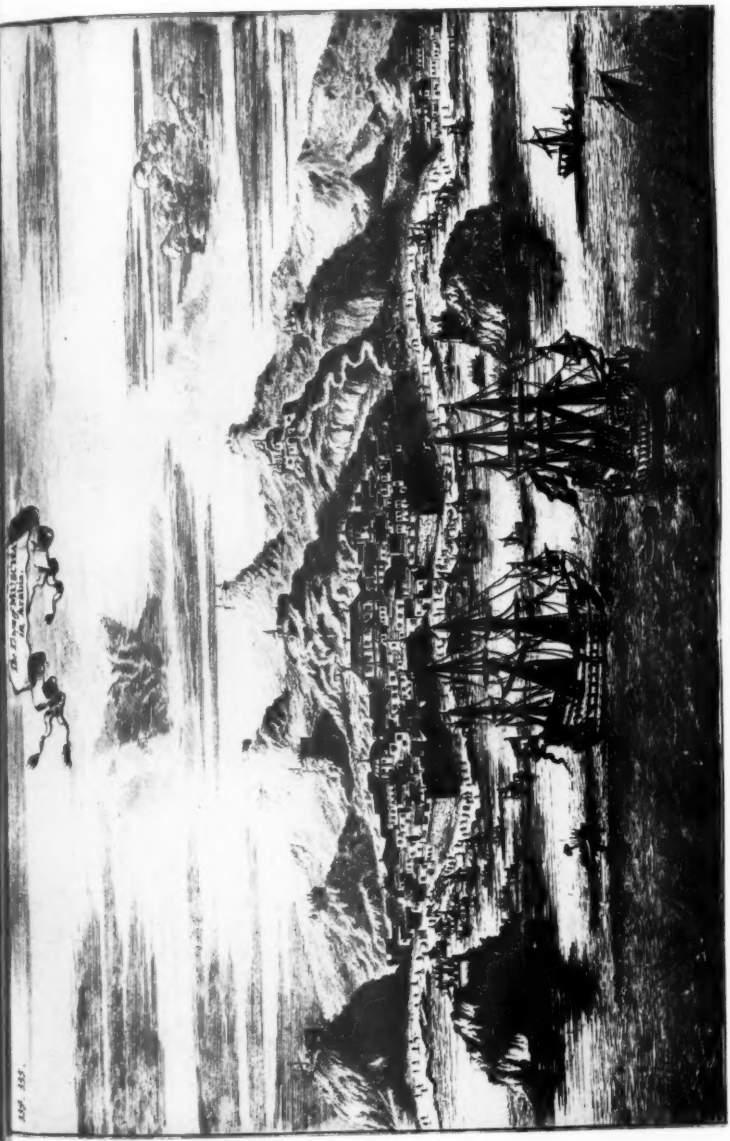
> "Off at sea north-east winds blow
> Sabean odors from the spicy shore
> Of Araby the Blest." *

It was the Mount Sephar of Genesis, the *Cana* of the Periplus of the Erythræan Sea, "to which all the frankincense produced in the country is brought by camels, on rafts, and in boats."

The people of Dhufar are of the Qahtan tribe—the sons of Joktan mentioned in Genesis: they are of Hamitic or African rather than Arab types; and their country, though it borders on the "Empty Quarter," must get its fair share of monsoon rains.

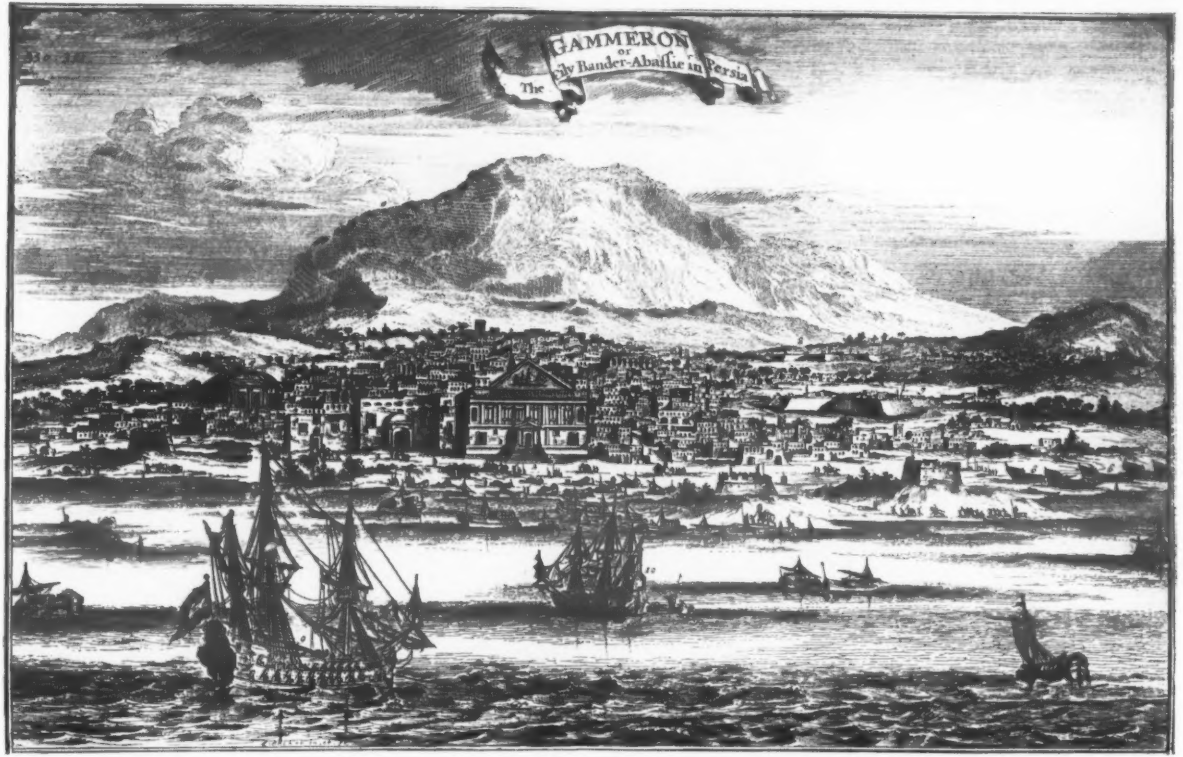
One hundred miles farther along the coast lies Masira Island, the Sarapis of the unknown author of the Periplus, famous even in those days for its tortoises, and inhabited, then as now, by "settlements of

* *Paradise Lost*, IV. 62–64.



Muscat

From 'The Voiages and Travels of John Struys.' London: 1684



Bandar Abbas

From 'The Voiages and Travels of John Struys'. London 1684

Fish Eaters, a villainous lot, who use the Arabian language and wear girdles of palm leaves." * Two thousand or more years have passed, but economic conditions have not changed, and are not likely to change, so it need not surprise you to know that when, in 1904, the British steamer *Inverdale*, of 2000 tons, with thirty souls aboard, was wrecked on the Kuria Muria Islands, the survivors landed at Masira and were massacred every one. But let us not judge these people too hastily, for when some vessels of the Spanish Armada were wrecked on the Irish coast only three hundred or so years ago (say ten generations) the crews were treated in the same way, and those that were not killed on landing, including some young boys, were collected later by Government officials and publicly hanged.†

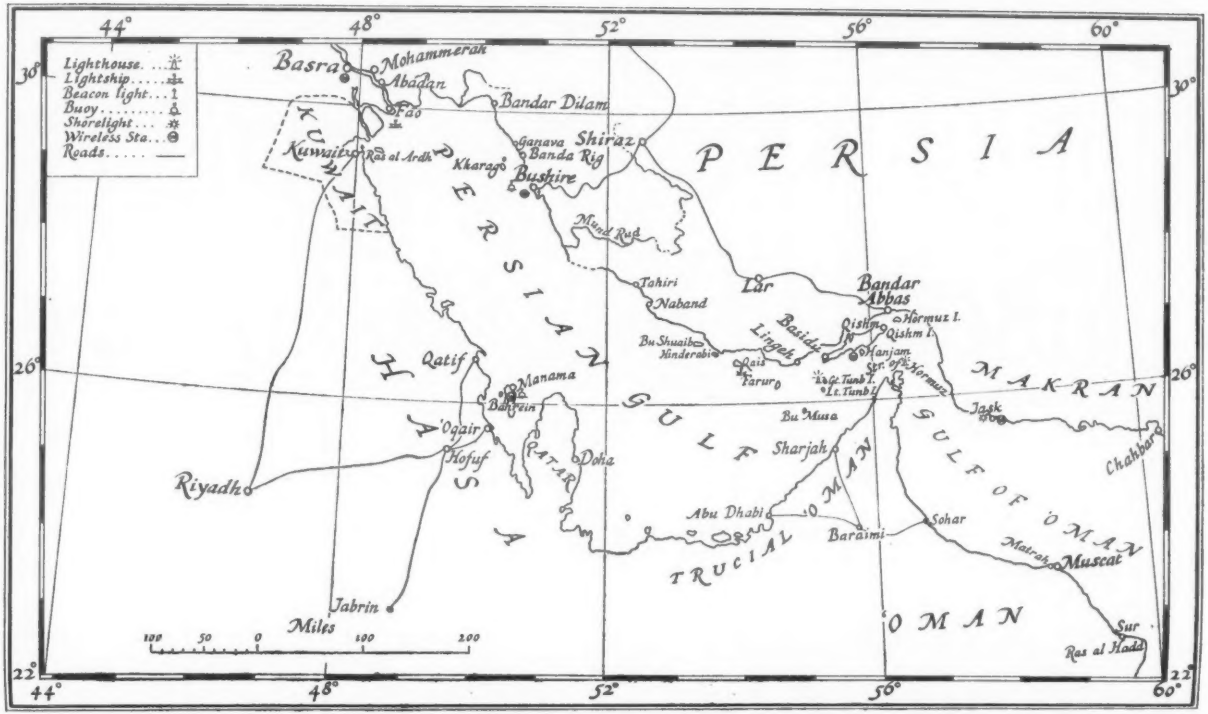
A day's steaming brings us to Ras al Hadd: we turn north-westward and enter the Gulf of Oman. Some 5 million tons of shipping—95 per cent. British—make this cape every year, but it has no lighthouse, though every master of a ship would like to see one there, provided it be a powerful one and absolutely reliable. But the local tribes owe doubtful allegiance to the Sultan of Muscat, and a lighthouse would be a tempting opportunity for blackmail or worse.

Just round the corner, tucked away in a convenient bay, lies the port of Sur, nominally part of the dominions of the Sultan of Muscat, but in reality almost independent under its own chiefs. The physical features of the port closely resemble those of the town of the same name on the Syrian coast, and it may well be that the latter was so named by Phœnician traders, who, says Herodotus, "came to the Mediterranean, according to their own account of themselves, from the Persian Gulf." The position of Sur, the first sheltered port on the Oman coast touched by dhows from India or Africa, has invested it throughout the ages with peculiar importance. Until the advent of steam, the high-pooped *bums* and *batils* manned and owned by Suris were to be seen in due season in every port on the Indian Ocean. Nowhere were better or faster ships built than on the Oman and Arab coast of the Gulf, no nation had more skilful sailors or more enterprising merchants. But steam ruined the industry, and dealt a blow at the maritime Arabs from which they have never recovered, for they have neither the capital, the knowledge, nor the resources to stand up against European steam vessels. Sur was long the centre of the slave trade from Africa, and the suppression of the traffic proved even more difficult here than at Muscat, despite the vigilance of patrolling cruisers, and the dhows plied a remunerative trade, as often as not under cover of the French flag. Retribution overtook the Suri slavers on the discovery of the headquarters of the traffic in Samuco Bay on the East African Coast, in 1902: a Portuguese naval expedition broke up the

* Schoff, 'Periplus of the Erythræan Sea,' p. 35.

† Lord Ernest Hamilton, 'Forty Years on,' p. 220.

Bandar Abbas



Sketch-map of the Persian Gulf

camp and captured the principal delinquents, who were brought to trial and sentenced to long terms of imprisonment. Sur has languished ever since, but is still a centre of some importance and, by virtue of its geographical situation, is a serious rival to Muscat and Matra.

Another 100 miles up the coast lies Muscat, one of the most picturesque harbours in the world. The town lies crammed into a narrow recess at the foot of the hog's-back range of Jabal Akhdhar, or the "Green Mountain" of Oman. The harbour is a lake of deep blue, where shoals of fish disport themselves in the clear water; the houses stand at the very edge of the surf, and the ruined fortresses of Jalali and Mirani, grim reminders of the great days of the Portuguese Empire in the East, crown the promontories that command the harbour on either side. A gap in the rocks, where a side breeze comes in from the ocean, renders life less insupportable during the appalling heat of the summer months.

An Arab writer (Abdur Razzak) has left on record the following rhetorical description of his own feelings of the climate here. "The heat of the sun," he says, "was so intense that it burned the ruby in the mine and the marrow in the bones: the sword in its scabbard melted like wax. . . . In the plains the chase became a matter of perfect ease, for the desert was filled with roasted gazelles." Lord Curzon, in more matter-of-fact vein, states that a sun temperature of 189° F. has been recorded. "The rainfall is only 3½ inches in the year, and the whole of this falls within a period of two or three weeks." In such conditions, it is not surprising that the genuine Arab has been swamped here in the African type.*

Albuquerque, in 1506, on his way to conquer Hormuz—which he regarded as one of the two key positions of empire in the Indian Ocean—after fruitless negotiations with the rulers of Muscat as to the amount of tribute to be paid, sacked and burned it, down to the very mosque and shipping in the harbour. Then commenced the strangle-hold of the Portuguese, which they did not relinquish until 1650.

Since then Muscat, with its sister port of Matra, the heart of the sultanate of the same name, has seen rulers of much ability, and has in consequence maintained its independence. It has figured largely in the efforts this country has made in the suppression of the slave trade and of the arms traffic. There is a British Admiralty coaling station at Muscat, about to be replaced by an oil-fuel station; let us hope that the Admiralty will take very special care to ensure that no oil is suffered to leak from the tank or barges, or be spilt when ships are refuelling, for it would need but little oil on the shores of the bay to make life intolerable, and fishing impossible, and the people at Muscat live mainly on fish.

It was of the people of Muscat that a boatswain of the Royal Navy, following the instructions of the Admiralty to make, when visiting

* 'Persia and the Persian Question.'

strange places, a report of the manners and customs of the inhabitants, penned the famous saying, "As to manners they have none; and their customs are very beastly." * In fairness to the place, however, it must be admitted that such a description of the people of Muscat is untrue and was probably never otherwise than libellous, and Sir J. Malcolm is careful to record that his informant described the author as "a blunt fellow of a master, an excellent seaman, but who troubles himself very little with matters on shore," and admitted that he only made the entry in despair, having evaded the order to do so as long as he could.

Shaping our course almost north-westward, in view of the palm-belted Batina plain, we reach at last the rocky extremity of the Akhdhar range. The rocks of Oman are Archæan, the very foundations of the world; yet even Oman is changing—rising ever so slowly, as the shelf or ledge around Muscat harbour and elsewhere shows. But time was when the hills were sinking and, at Musandam, which we now approach, their outposts have been cut off and stand knee-deep in the invading waters. Some of these sentinel islands, almost overwhelmed by the sea, still keep watch, and tear the vitals of ships which venture over them. Two such rocks there are here, like Scylla and Charybdis, between which lies a deep channel and a tempting short cut into the Gulf; but through the gap runs so fierce a current that not even a steamer can breast it without risk of destruction against these terrible crags; all masters are warned against attempting it, but some must needs, now and then, try their luck. Thévenot (1603) records how "some English one day, being half drunk and having a good Wind, would needs in a frolick sail through that Channel, but so soon as they were got in, the Wind failed them, and they were in great danger of splitting against the Rock; however they preserved themselves with Fenders and Poles, but not without a great deal of trouble, and were sufficiently scared before they got out again: if it had blown hard, they must infallibly have been split."

Standing athwart the Strait of Hormuz, these two rocky islets are known to the Arabs as *Salamah wa banat-ha* (the Pilot's daughters), but to us by a name given them by British tars two hundred years ago—The Quoins, an old English word for "wedge," which they strongly resemble, derived from similar Latin and Greek words. On the smaller of the two stands a lighthouse, the first met with on our way excepting minor shore lights at Muscat, Jask, and Charbar. Built and, until recently, kept at the joint charge of the British and Indian Governments, it is, except for the small lighthouse at Muscat and shore lights at Jask and Charbar, the first public indication of our marine interests in these waters and of our acceptance of certain responsibilities consequent thereon.

* Malcolm, 'Sketches of Persia' (1861), p. 9.

To the south lies the unscalable headland of Musandam, the *Mons asabo* of Ptolemy, and the "headland projecting far out into the sea, about a day's sail distant," probably descried first by European eye when Alexander's admiral, Nearchus, in 325 B.C., reached the Strait from the mouth of the Indus. "Those who understood the situation of the Country," writes Arrian, "affirmed that this Promontory belong'd to Arabia, and was call'd *Maceta*, and that Cinnamon, and other fragrant Spices were convey'd thence to the Assyrians." The same promontory was the *Maka* of Eratosthenes. According to Juba, navigation in this locality was regarded as impracticable on the Arabian side "on account of the rocks." When Onesicritus, the pilot of Nearchus, viewed this promontory, so alluring did it appear that he gave orders that the fleet should steer directly thither, until he was seasonably reminded by Nearchus "that he must have a shallow Memory, if he did not remember for what Purpose the Fleet was ordered to pass those seas." *

The shores of the Musandam promontory are inhabited by the Shihuh, a very curious and primitive race, who speak a dialect unintelligible to Arabs, and on whom we may, I hope, expect fresh light before long. Within Musandam, piercing its very heart, are the wondrous fiords of Elphinstone and Malcolm Inlets, probably the hottest places on Earth. On an island in this hell of rock and sea was once established a submarine cable station—but not for long, for neither the British nor Indian staff could endure the climate and the total lack of all amenities. Two members of the staff having succumbed in as many years, and the protests of the survivors being disregarded by Government, they are believed to have set fire to the station, as a result of which a new arrangement was made, involving relay stations at Jask and Hanjam. There were times not long ago when most British Consuls and Political Agents in the Gulf wished that their predecessors had taken equally heroic measures, for almost everywhere in the Gulf they were very badly housed, and provided with none of those amenities, such as ice, electric light, and fans, which do so much to render life in hot countries agreeable, though not of necessity more healthy.

Jask, in olden days, says Herbert, "famous in nothing except her prospect into the Gulf of Persia," is now of importance as the point of junction of the ocean cable and the land line from India. Here the traders of the East India Company landed their first cargo of goods in Persia and started that commercial intercourse with the country, which was later on to have such far-reaching consequences. Cæsar tells us in his Commentaries, that "the merchants" gave him the information that led to the invasion of Britain. The East India Company harboured no such design, and our early conflicts in the Persian Gulf were not with the inhabitants, but with the rival European powers, seeking a monopoly

* Rooke, 'Arrian's History of Alexander's Expedition,' p. 265 f.

of trade there. At Jask was killed, in a sea-fight with the Portuguese, a worthy Englishman, whose epitaph Herbert writes as follows :

> " Here lies buried one Captaine Shilling unfortunately slaine by the insulting Portugall : but that his bones want sence and expression, they would tell you the earth is not worthy his receptable, and that the people are blockish, rude, treacherous, and indomitable."

From Jask the land telegraph lines run along the Makran coast to Karachi. To maintain them, as has been done by the I.E.T.D. continuously for nearly sixty years, along this torrid shore inhabited by tribesmen whose sole means of showing their independence was to cut the wire, is no small feat. It has not been done without loss of life, but the record of this section of the Telegraph Department is, on the whole, creditable to both sides. A cable runs eastwards as far as Charbar and westwards to Hanjam, where it is relayed, and connected by another short length of cable with Bandar Abbas. At Hanjam is a wireless station, enabling ships to announce the probable date and hour of their arrival at any port in the Persian Gulf except those on the Trucial Coast.

To the north of the Quoins lies Larak, and still further north Hormuz. The stretch of water here is the key of the Gulf, and Malcolm Inlet is the pocket in which we may keep the key, for in that majestic solitude of torrid mountains and deep water the whole British Fleet could ride safely at anchor, should need arise. Hormuz, once an emporium comparable to modern Bombay, is now almost uninhabited. Barren it always must have been, for " the island has no fresh water, save what the fruitfull Cloudes weepe over her, in sorrow of her desolation, late so populous," says Thomas Herbert, who was there not long after the Portuguese were ejected by a joint force of Persians and English in 1622, in the days of Shah Abbas the Great. The sole commerce of Hormuz to-day is in red oxide for export and rock salt for local use, but it has been the scene of great adventures. Hormuz was already important as an emporium (as witness Friar Odoric, 1330) before it was finally conquered, in 1515, after more than one effort, by the great Albuquerque, who recognized in it one of the key positions necessary for the establishment of a Portuguese Empire in the East. On the expulsion of the Portuguese, the once famous city was soon stripped of all that was of value and left to a natural decay ; and the small island whose wealth and luxury were once proverbial, which is said to have boasted a population of 40,000 souls, is now a barren rock inhabited by some 200 sturdy families of fishermen, living in huts under the shadow of the old Portuguese fort. It is vain to speculate on what might have been the course of events in the Gulf had the English not joined forces

with the Persians against the Portuguese; it is sufficient to recognize that much was at stake on the day on which that decision was made.

On the destruction of Hormuz, Shah Abbas formed magnificent plans for a great seaport on the mainland, to bear his name: Bandar Abbas rose from the ashes of Hormuz, and to the newly founded port was transferred the trade of the dead city. The climate of the town has an evil reputation: the learned Doctor Fryer mentions that the British sailors of the East India Company "stigmatized this Place for its Excessive Heat, with this sarcastical Saying, *That there was but an Inch-Deal betwixt Gomberoon and Hell*";* but, to quote Lovat Fraser, "it has its compensations, and when its sleepless nights are forgotten, the vision of Hormuz across the water, incarnadined in the sunset and glowing like a jewel, lingers in the memory." †

Bandar Abbas for over two centuries maintained its supremacy as a commercial port, thanks to good land communications with the capital at Isfahan, and to its anchorage, which was convenient and good for the ships of those days. But to-day ships must anchor a mile or two from land, and there is no shelter from most winds; whilst the Bushire–Shiraz route, which is more or less passable for wheels, has tended to divert traffic, with the result that trade in Bandar Abbas has not increased as at some other ports.

A few miles east of Bandar Abbas lie the rich gardens and date groves of Minab, which first gladdened the eye of a European in 325 B.C., when Nearchus put into the creek on his voyage up the Gulf and learnt the whereabouts of Alexander's army. "Here they arriv'd," says Arrian, "at a town called *Harmozia*, at the Mouth of the River *Anamis*, in a Country pleasant and agreeable, and abounding in every thing, except Olives. Here, going on Shore, they gladly refresh'd themselves, after so many, and hard Labours, and joyfully reflected on the various Accidents they had encounter'd, during the whole Voyage." ‡ At Minab died, two thousand years later, Maani, the Syrian wife of the traveller Pietro della Valle. She does not lie buried here, however, for he caused her body to be embalmed and carried it about with him for four years until, on his return to Rome, he had the mournful satisfaction of giving her honourable interment in the cemetery of her ancestors. He himself died in 1652.

Leaving Bandar Abbas and taking at first a south-westerly course, we soon have Qishm island to starboard, and separated from the mainland by Clarence Strait. We are now well within the Gulf itself. The first notice of the island seems again to be that of Arrian, who says: "And setting sail (from Harmozia), in a run of 300 stadia they passed a desert and bushy island, and moored beside another island which was

* 'Fryer's East India and Persia,' Hakl. Soc., 2, 165.

† 'India Under Lord Curzon and After,' 1911.

‡ Rooke, 'Arrian's History of Alexander's Expedition,' chap. xxxiii.

large and inhabited—the small desert island was called *Organa* (Jerun, Hormuz); and the one at which they anchored *Oarakta*, planted with vines and date palms, and with plenty of corn." * The Portuguese had a strong fort on the side of Qishm opposite to Hormuz, constructed to guard the water and other supplies upon which Hormuz depended for its very existence. It was at the storming of this fort by a combined English and Persian force that the discoverer of Baffin's Bay met his death. Purchas, in 'His Pilgrimes,' quaintly tells us that "Master Baffin went on shoare with his Geometricall Instruments, for the taking the height and distance of the Castle wall, for the better leavelling of his Peece to make his shot; but as he was about the same, he received a small shot from the Castle into his belly, wherewith he gave three leapes, by report, and died immediately." He was buried on the island.

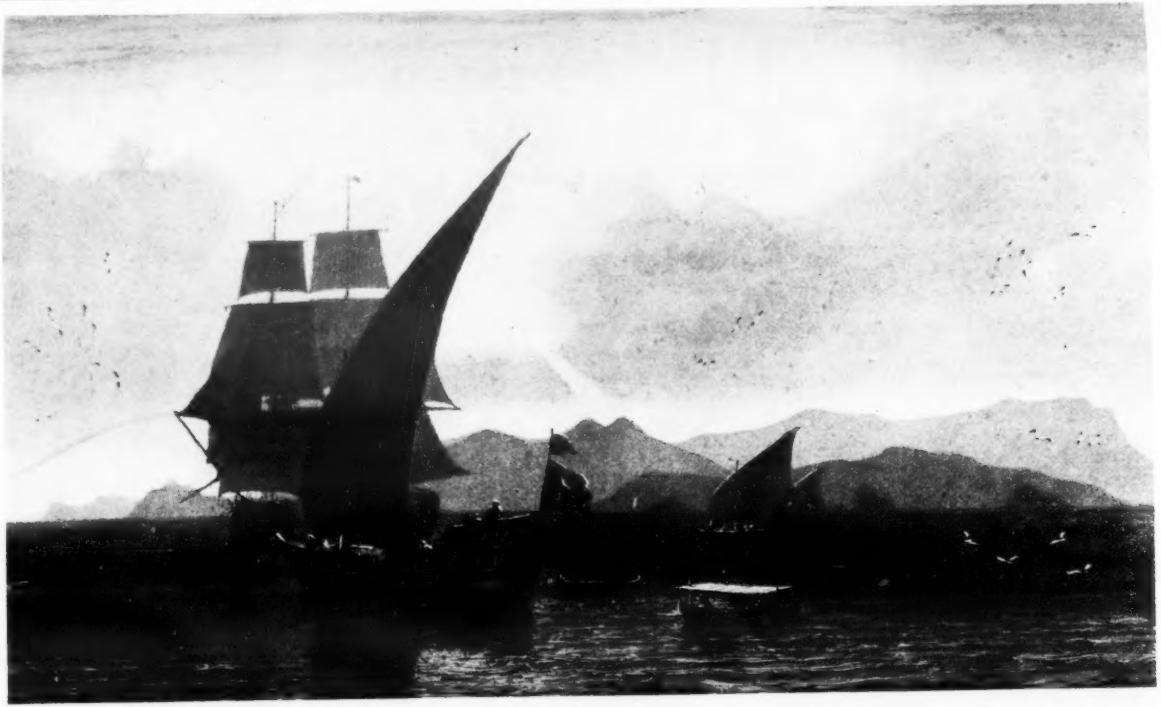
Basidu, or "Bassadore," as it was known to British sailors, is on the north-western extremity of Qishm, exposed to all the winds that blow. It was ceded to the British Crown in 1817, having been selected, after the suppression of piracy on the Arabian coast, as a base for the squadron responsible for keeping order in the Gulf and protecting trade. The vision of a convenient headquarters for naval activities soon vanished, however, for the summer, with its intense heat, proved detrimental to the health of the occupants, and the station was abandoned in 1823. Only a native agent was left there to guard the stores that had been accumulated; but the British flag still flies there on occasions.

About 25 miles due south of Qishm lie the Great and Little Tanb islands, known to our forefathers as "The Tombs." On the larger of the two is a fine lighthouse of the same power as that on the smaller Quoin. A barren island this, standing stark out of the water, inhabited—except for a few months when cattle belonging to the Shaikh of Sharja, to whom the island belongs, are brought from the Arabian side to graze—only by snakes, seafowl and, in spring, by the ubiquitous swallows, which build their nests every year in the quarters of the lighthouse crew, well knowing that from Ireland to Cape Comorin no man will molest them, be he Persian, Arab, Turk, Indian, or European, for their presence brings good luck to the house. This belief is of great antiquity.† The lighthouse crew, mostly Indians from the Ratnagiri district, here and on the Little Quoin rock, must surely find time lie heavy on their hands, for the lighthouse tender visits them only once every few months, bringing food, water, and a relief crew. Yet there is no lack of competition for the duty!

Close by the Tanb islands, in 1800, the East India Company's cruiser *Sylph*, a schooner of 18 tons, was attacked by Jawasmi pirates. Commanders of British vessels in those days received from the Bombay Government peremptory orders, any infringement of which would involve

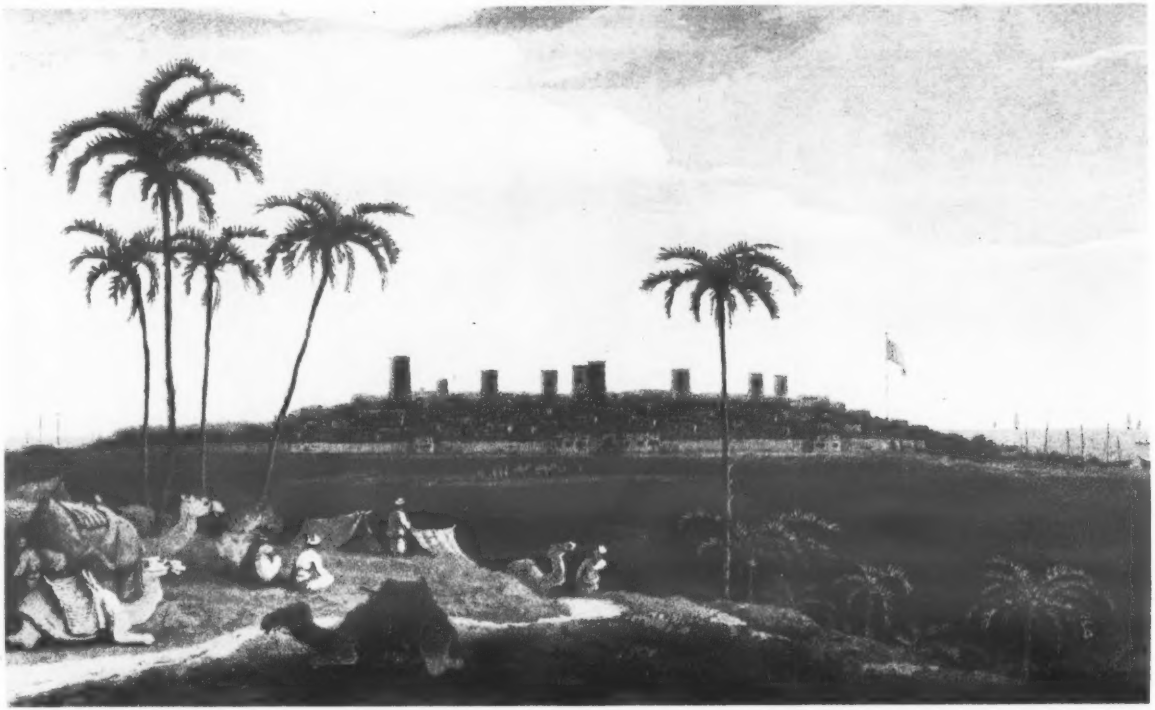
* McCrindle, 'Arrian's Account of the Voyage of Nearchus,' 1879.

† See Sophocles, 'Elect.,' V., 149; also Sale, 'The Koran,' p. 499.



Cape Musandam

From James Morier's 'Journey through Persia.' 1812



Bushire

From James Morier's 'Journey through Persia.' 1812

dismissal, on no account to fire on Arab craft until they first opened fire. These orders placed a small cruiser absolutely at their mercy, for the Jawasmi cared not to engage in a gunnery duel with British seamen; their tactics consisted in running alongside an enemy and throwing on to the deck of the vessel some hundreds of men armed to the teeth, thus bearing down all resistance.

The dhows in this case quickly ran alongside, with their overhanging prows; in an instant the decks of the *Sylph* were swarming with desperadoes who, with the name of the Prophet on their lips and a thirst for Christian blood in their hearts, commenced a wholesale massacre, and in a few minutes almost the entire crew had perished, fighting desperately. The arrival of a large sister ship prevented the Jawasmi from killing the rest and sinking the ship. This and similar outrages at length opened the eyes of the Government of Bombay and Court of Directors to the absurdity of the instructions enjoined upon naval officers. The public voice called for the punishment of the piratical horde, but it was not until the blood-red Jawasmi flag was seen even on the coasts of India that the authorities completely awoke to a sense of shame.*

The home of the Jawasmi was that stretch of low shore running south-west of Ras Musandam and due south of the Tanb islands; here lie sweltering beaches and yellow sands, a desolate windswept shore, and a tangle of narrow creeks and shallow lagoons, only partially explored even in this day, but then hardly known at all. Navigation is difficult even for native craft, and such a locality was well calculated to afford protection to the pirates and to render their suppression exceedingly difficult. The Jawasmi headquarters was the town of Ras al Khaima, formerly known as Julfa, on a sandy spit enclosing a deep narrow bay protected by a bar. Other Jawasmi resorts were Sharja and Abu Dhabi. Thence, inspired largely by Wahabi tenets, they made their sallies, at first confining their activities to native craft, but, as time went on and they waxed in strength, fearing not to attack even British vessels. A naval and military expedition despatched in 1809 from Bombay to Ras al Khaima, with the object of destroying the power of the Jawasmi, succeeded only in keeping them quiescent for a time, and it was not until 1819 that conclusive action was taken. A powerful armament proceeded again to Ras al Khaima and, after a stiff resistance and a siege of six days, the town was captured, the Jawasmi boats burnt, and the forts razed to the ground. Negotiations followed for a treaty of peace, which was concluded in 1820, and the "Pirate Coast" became the "Trucial Oman." That treaty has never been broken; and, with one or two exceptions, the present chiefs of the Trucial Coast are the direct descendants of those who signed that treaty, and they enjoy a not less ample independence than their fathers enjoyed. The reason why the Persian Gulf has enjoyed peace for a hundred years is, that we

* Low, 'History of the Indian Navy,' 1877.

thoroughly defeated the enemies of law and liberty, before we made a treaty.

The outcome of such vigorous but somewhat tardy action was the final pacification of the Arab coast of the Gulf and the abolition of overt acts of piracy: our task is not even yet complete; isolated acts of piracy occur almost every year, but these sporadic cases are usually swiftly punished, and on the whole our work stands good. Retired pirates from being raiders of the pearl fleets of Bahrain have become pearl divers on the adjoining banks—also a gamble which adds a zest to their hard life.

Retracing our steps and pursuing our course from Tanb, a few hours' steaming bring us opposite Lingeh on the Persian coast, now a shadow of its former self. Time was when, as a centre for the collection and export of pearls, it rivalled even Bahrain; the headquarters of this business is now on the Arab coast, where the local authorities know better than those in Persia how to foster trade and to encourage local initiative. Viewed at a distance the town could almost claim to be the prettiest place on the Gulf, with its houses and minarets backed with palms and the tinted mountains behind; but this vision of beauty hardly bears close inspection.

A few hours bring us to Qais island, where lies anchored a lightship. We have reason to believe that this island once contained a flourishing city, though the remains now consist of little more than mere mounds of stone, blocks of masonry, and ground strewed with fragments of pottery and Chinese porcelain. A "great emporium of trade" is indicated by various of the mediæval writers, though it is somewhat difficult to understand how it flourished, since there is no sheltered harbour and the anchorage is open to one or other of the prevailing winds. Qais appears to have been at the height of its glory when visited by Benjamin of Tudela between 1164–1173 A.D. He says that, though there was no agriculture owing to the absence of springs, so that the inhabitants were obliged to drink rain-water, it "is however a considerable market, to which Indian merchants and those of the islands bring their commodities; while the traders of Mesopotamia, Yemen, and Persia import all sorts of silk and cloths, flax, cotton, hemp, etc., which articles form objects of exchange; those from India import great quantities of spices, and the inhabitants of the islands live by what they gain in their capacity of brokers of both parties." Qais seems to have lost its importance—for what reason it is not known—somewhere in the fourteenth century, and its trade passed to Hormuz.

There is a legend, reminiscent of Whittington and his cat, regarding the early settlement of the island. The following is one of many versions: One Keis, the son of a poor widow in Siraf, embarked for India, with his sole property, a cat. He fortunately arrived at the island at a time when the palace was so infested by mice or rats that they invaded the

king's food, and persons were employed to drive them from the royal banquet. Keis produced his cat, the noxious animals soon disappeared, and magnificent rewards were bestowed on the adventurer of Siraf, who returned to that city, and afterwards with his mother and brothers settled in the island, "which from him, has been denominated Keis, or, according to the Persian, Keish." *

Qais had succeeded Siraf in the proud place of principal emporium of the Gulf somewhere in the eleventh century. The site of the latter place has been identified with that of modern Tahiri, situated some 70 miles farther along the coast. West of Tahiri are to be seen the ruins of the old Muhammadan port of Siraf, extending for a mile or more along the shore and up the slope of the foothills. Farther inland, in the slopes of ravines which come down from the hills, are other remains apparently pre-Islamic; in one place the hillside over a space half a mile square has been worked into tiers of remarkable troughs, the origin and purpose of which so far remain unexplained. The earliest reference we have to Siraf is in the ninth century in the ancient accounts of India and China by two Muhammadan travellers who went to those parts and who tell us that it was then the chief mart of the commerce between West and East as far even as China. Istakhri (tenth century) tells us: "the most important town of the district . . . is Siraf, which is almost as large as Shiraz; its houses are of teak wood or of other wood from Zanzibar; they have several stories. The town is situated on the sea coast, is covered with fine edifices and is very populous. . . . The imports are aloes wood, amber, camphor, precious gems, bamboos, ivory, ebony, paper, sandal wood, and all kinds of Indian perfumes and drugs." Here Arab dhow and Chinese junk anchored side by side. That the trade must have been considerable is evident from the receipts of customs of the port, which, according to Ibn ul Balkhi, amounted to 233,000 gold dinars.

Siraf, Qais, and Hormuz, in association with old Basra, epitomize the commercial history of the Gulf during the Muhammadan era. They flourished successively at a time when the Persian Gulf still formed part of the principal route of communication and trade between West and East—before the "sea-way" round the Cape was found.

We will now cross the Gulf in a due south-westerly course, to the Bahrain islands, which lie "between the two seas" in the bay separating Qatar from Hasa. Two acetylene gas buoys maintained by the British Government guide our ship to the inner anchorage of Manama, the commercial capital of the principality. The Shaikh resides mostly at Muhurraq on the smaller of the two islands, possibly the *Tylos* of the classical writers. Aged nearly ninety, Shaikh Isa bin Ali al Khalifa, K.C.I.E., the doyen of the Arab chiefs of the Gulf, first became independent ruler with the support of the British Government—as against

* *Tarikh i Wesāf*, of Abdallah Shirazi (thirteenth to fourteenth century).

Turkish pretensions to sovereignty—in 1869. He handed over the reins of office to his eldest son, Shaikh Hamad, under pressure, three years ago.

At Bahrain we are at the centre of the pearling industry. The best pearls in the world come from the Gulf. The number of operators personally engaged in the industry throughout the Gulf is 75,000 at least, and this number does not take in the reckoning the families of the operators or the very numerous merchants whose funds are invested in the business. The value of the pearls exported in 1904 was at the lowest computation £1,500,000; at the present day the value is probably at least £3,000,000 a year, of which Bahrain gets the lion's share. The richer merchants are mostly Arabs, who are almost as familiar with Bombay as with Bahrain; one and all are experts in pearls, and many now own motor cars, the possession of which, together with the installation of electric light and fans, may make them less inclined to hanker after the garish pleasures of Bombay.

An interesting field for investigation is open to the archæologist in Bahrain island, where, near the Arab village of Ali, are to be found tumuli of ancient but uncertain date, covering several square miles. For over a generation past there have been tantalizing accounts of these: Theodore Bent in 1889, Captain Durand in 1879, and Major (now Lieut.-Col.) Prideaux in 1906–7, had in turn excavated among them, but nothing definite was known of their age. It was thought possible that the tumuli were connected with a migration from Egypt; so in 1925 Mr. E. Mackay, who had worked in Mesopotamia, was asked to excavate further at Bahrain for the British School of Archæology. He opened up some thirty-five chambered tumuli, but the results were scanty, as was the case with the previous excavators. The form of a bronze spear-head indicates about 1200–1500 B.C. as the period, and the pottery would agree with such an age. Some of the pottery is of forms known in Mesopotamia, but most of it is independent, and shows what was the style in the East Arabian civilization. The back of an ivory statuette is of good workmanship, but not like anything known elsewhere. It seems likely that the island was a cemetery for bones transferred from the mainland after the bodies had decomposed.*

One is prompted to surmise that the island may have been the burial place of the *scala* of ancient Gerra, the site of which may well have been near the present-day port of Ujair (Oqair), on the mainland of Hasa, as suggested by Philby and Cheesman.

Bahrain has for many years been the centre of American missionary enterprise in the Gulf: other places at which they work are Kuwait, Basra and Muscat. It will be within the recollection of you all that Christian missions in China have recently been denounced. I have not seen missions at work in China, but I have seen them at work in

* Flinders Petrie, *in epistola.*

Arabia, Mesopotamia, and Persia, for the last twenty years, and I should not like to speak about the Persian Gulf without bearing testimony to the wonderful work they are doing. I do not suppose they have made converts in appreciable numbers, but they have, by their labours, assisted by the high standard of rectitude displayed by British officials and British merchants, profoundly modified the Arab outlook in ethical matters. The Arab is a Muhammadan first and an Arab after, like all Islamic races; he regards Europeans, likewise, as Christians first and foremost. He knows, perhaps better than we do, that our standard of conduct has its basis in the religion of our country; he respects our standard of conduct, and without adopting our religious views he tends, unconsciously, to recognize our standard of conduct as higher than his. He does not despise, but greatly respects, those who devote their lives to spreading, by example and by teaching, the Christian religion. There is no greater influence for good in the Gulf than the Christian missions; no Europeans are so universally respected as are the missionaries, such as Zwemer, Van Ess, Harrison and Mylrea, and those who decry foreign missions do less than justice to themselves and harm to our good name.

To the east of Bahrain lies the Qatar peninsula, of which Palgrave's description is the best extant. He says, "To have an idea of Katar, my readers must figure to themselves miles on miles of low barren hills, bleak and sun-scorched, with hardly a single tree to vary their dry monotonous outline: below these a muddy beach extends for a quarter of a mile seaward in slimy quicksands, bordered by a rim of sludge and seaweed. If we look landwards beyond the hills, we see what by extreme courtesy may be called pasture land, dreary downs with twenty pebbles for every blade of grass." Like Bahrain, Qatar owes its existence to a limestone fold so gentle that the ground-level in the centre of the peninsula is only 250 feet above the sea.

In these waters "schools" of porpoises are frequently met with; they leap out of the water towards us till the sea is churned up and its surface flecked everywhere with their shining bodies. Arrived within a few hundred yards, they turn off, but a few remain to gambol just ahead of the ship, keeping only a few inches from her bows and maintaining their position at 14 knots with the utmost ease. At night they may be seen as clearly as by day in the cold phosphorescent light created by the movement of the ship. And, if we are lucky, we may witness one of those remarkable atmospheric phenomena which occasionally occur in the Gulf, more particularly west of the Quoins. Such an appearance was observed by passengers of the *Eden Hall* in March 1908, near Hormuz. "It was dark at the time, with a very glassy sea, when it suddenly appeared as if some one was turning flashlights on the ship. It turned out to be waves of light wheeling round the ship in the air just over the sea, and not actually on the surface. The phenomenon was

observed for twenty minutes." * A similar spectacle has been observed in the Malacca Strait.

A brief reference to the temperature of the surface waters of the Persian Gulf may not be altogether out of place at this point. Fanciful statements have been made with regard to meteorological conditions in the Gulf: it has been alleged, for instance, that the temperature of the water rarely falls below 33° C. all the year round. Happily matters are not so bad as that. According to available data, at the mouth of the Shatt al Arab it actually falls as low as 15° in February, and in August rises to a mean of 32°; frequently it reaches 34·5°, and has been known to touch 36°—the temperature of a warm bath! Thus the variation throughout the year is as much as 17°. In the Indian Ocean the corresponding variation is only 6–7°.† Again, the salinity of the surface water (to 25 metres depth) of the inner Persian Gulf is high compared with that of the outer ocean. A salinity of 40 per 1000 has been observed in the month of February at Bushire, similar to conditions in the most northerly part of the Red Sea. But tests have shown that, especially at the head of the Gulf, the salinity varies considerably—in summer it is low, and in winter high. There may be other factors, *e.g.* rainfall, but the chief cause of the difference between the salinity in summer and winter of the surface water, in this locality, seems to be the discharge of the Shatt al Arab; the decrease in salinity during May and June synchronizes with the flood of the Euphrates and Tigris rivers.‡ The subject suggests a useful field of inquiry.

A hundred miles, almost dead north of Bahrain, brings us to Bushire, the headquarters of our political influence in the Gulf. We have to come to anchor 6 miles from the shore, unless our draught and the tides enable us to reach the inner anchorage 3 miles nearer; both anchorages are marked by lighted buoys, and a further mark is a powerful light on the flag-staff of the Consulate-General. A desolate place Bushire appears from the sea, but few spots in the Gulf are more popular with Europeans. It is virtually an island separated from the mainland by 9 miles of mud flats: it is the *Mesambria* of Arrian, "a peninsula, wherein were many gardens and all kinds of trees that bear fruit," and was visited by Alexander's fleet.

Here lives the Persian Governor of the Gulf Ports and the Belgian Director of Customs; and here, in the inner harbour, riding at anchor, is to be seen the *Persepolis*, a German-built vessel, sole remnant of Nasir ud Din Shah's navy, now for sale. The quarantine officials, Englishmen—for this service is run by us on behalf of the Persian

* See further *J.B.N.H.S.*, 1917, xxv.; and *Geogr. Journ.*, **61** (1923), p. 66.

† G. Schott, "Geographie des Persischen Golfes und seiner Randgebiete," *Mitt. Geogr. Ges. in Hamburg*, 1918, 31.

‡ G. Schott, "Der Salzgehalt des Persischen Golfes," etc., *Ann. der Hydrog.* 1908, 36.

Government—come on board, sometimes by sailing craft, sometimes in a crazy launch which is all that the greatest naval Power in the world provides for its Chief Representative in these waters, sometimes in an almost equally derelict launch of the B.I.S.N. Company. Prudent passengers will elect to go ashore by sailing craft if it be rough. Bushire owes some of its importance to the fact that it is the terminus of the most frequented and shortest road from the coast of the Gulf to Shiraz and the interior of Persia.

The derivation of the name Bushire has for long been the subject of controversy. The popular derivation from Abu-Shehr is, for etymological reasons, unlikely to be correct. Dr. Herzfeld, who has made a special study of geographical sites and names in Sasanian times, suggests that the name is some compound of *B* . . . and *Ardashir*, but not "Bakht," as suggested by Curzon. Towns, he says, were assigned names connected in some way with the kings of the dynasty, cf. Riv-Ardashir (Reshire) and Ram-Hormuz.

It has been known for some time that the island (or peninsula) of Bushire offers a worthy field of investigation for the archæologist, and something had been done in a perfunctory way to reveal its secrets. It was not until 1913, however, that M. Pézard made excavations which revealed the historical parallel of the site of Sabzabad with Susa; and he was able to report that "the excavations at Bushire demonstrate that the region was occupied at a very remote epoch by a population, possibly proto-Elamite (but in any case very primitive), belonging to the Eneolithic age." During the Muhammadan era, the site of Sabzabad appears to have been abandoned for the west of the peninsula, where arose the ancient port of Reshire, itself abandoned a century ago, as shipping increased in size, for the present Bushire.

Weighing anchor and taking an almost due north-westerly course for the head of the Gulf, after about 30 knots, we pass within sight of Kharag and the smaller island of Khargu. The larger is not more than 12 miles in circumference, and consists of barren table-topped hills which rise to 250 feet. Though of small extent, Kharag has figured conspicuously in the Gulf history. In 1753, it became the headquarters of Dutch commercial activities in the Gulf, after they had abandoned their factory at Bandar Abbas and had been virtually expelled from Basra; but they held it only for a few years until, in fact, they were ousted by that notorious feeebooter and pirate Mir Muhanna of Bandar Rig, whereupon their influence in the Gulf came practically to an end. The English next had a short but precarious hold upon the island, but relinquished it to its native owners as being too troublesome, and it became a convenient haunt for pirates. Later, the English twice occupied Kharag as a base of operations against the Persians during their attacks on Herat—in 1838–42 and in 1856–7; and more than once was the proposal put forward to make it the British Headquarters in the Gulf. Even to the

present day the pilots for vessels making the passage across the bar of the Shatt al Arab are mostly inhabitants of Kharag or of Bandar Rig on the mainland.

Kharag, too, seems to have a history stretching back into the dim past; it holds rock-cut tombs, some sixty in number, regarding which Professor Herzfeld—who examined them recently—says the two larger ones are catacombs of the third century with peculiar architectural features. Crosses, typically Nestorian in form, cut in the walls, are still visible, and there are almost obliterated remains of inscriptions in vertical Syriac script. The conclusion is that the tombs are Christian.

During the war, Kharag was extensively drawn on by the Expeditionary Force in Mesopotamia for road metal. The quarries have recently been reopened by the Anglo-Persian Oil Company, and during the first year and a half over 40,000 tons of stone were shipped to Abadan. The only other industry of any importance is pearl fishing, in which about a hundred men are engaged. Nearly opposite Kharag lies the small port of Ganawah, from which the same company have built a road some 60 miles inland, to localities where explorations for oil are in progress.

Twelve hours' steaming from Bushire brings us to Kuwait Bay, sometimes described as the best harbour in the Gulf, though, as the late Shaikh Mubarak (who became its ruler in 1896) once remarked to a globe-trotter: "It may be a good port, but there is nothing to put in it." The jurisdiction of the Shaikh of Kuwait extends nominally for some 200 miles down the western side of the Gulf, when it meets the Hasa territory of Ibn Saud. The shaikhs of Kuwait, who are of the Sabah family, retained a *de facto* independence, notwithstanding the blandishments of their former Turkish neighbours of Hasa and Basra.

The present ruling chief, Shaikh Ahmad al Jabar, C.I.E., enjoys in a high degree the respect of the Arab world, and the confidence of his subjects. His grandfather, Shaikh Mubarak, was perhaps the finest Arab of his generation. "He sat," to quote Lovat Fraser, "in his high chamber, gazing seaward with his inscrutable eyes, with the face of Richelieu and something of Richelieu's ambition yet unquenched within him."

The rule of the Shaikh of Kuwait is personal and absolute. Autocrats, whether in the East or the West, and whether in palaces or parliaments, are as a rule ill informed, for their dependants curry favour by colouring or suppressing unwelcome truths. Though an Arab ruler is generally an autocrat, he is seldom ill informed and, in Kuwait at all events, public opinion has the fullest freedom of expression in the coffee-shop where the Shaikh holds daily court; to him are brought for decision all cases which cannot be amicably settled by agreement; before him any man or woman may state his or her argument without the cost of employing a lawyer, for there are none.

We steam out of Kuwait Bay past the beacon at Ras al Ardh and

past Failaka island, feeling our way gingerly through shoal waters towards the Shatt al Arab. Steaming slowly and guided, as we approach the bar, by the lightship, we anchor near the pilot vessel and wait, along with other vessels, till a pilot comes off. The lightship anchored here is a modern invention and a source of no small pride to those of Basra who are responsible for it; but a thousand years ago lights for the guidance of the mariner existed not only here but at other places along this muddy and shoaly coast, when even in those days the sea traffic from Basra was very great. Masudi in the tenth century tells us, "there are marks of wood erected for the sailors . . . on the side of Ubolla and Abadan, which look like seats in the middle of the water and upon which fires are burnt by night, to caution the vessels which come from Oman, Siraf, and other ports." Idrisi (twelfth century) tells us that such another construction was "situated at the place where the Dijla (Tigris) discharges its waters into the sea of Fars." We turn, however, to Nasir i Khusraw (eleventh century) for the most realistic description of these erections, which were known as *khashab*. He says, "they are erected for a double purpose: firstly, for lighting during the night by means of lights enclosed in glass to protect them from the wind; and secondly, to show the navigator his position. By day a smoke fire was kindled which indicated the position of the landmark from afar. The *khashab* is formed of four great posts of *saj* (teak) wood placed in a square, and having the form of a catapult; the base is broad and the top narrow, and the height above sea-level is forty *guez*.* On the top are placed stones and tiles resting on pieces of wood in such a way as to form a platform on which is a square cabin for a watchman."

I have already attempted to analyze, in the *Journal* of this Society,† the origin of the mudshoals which form the bar of the Shatt al Arab, and the great changes both in the configuration and position of the coast-line since the times when the Euphrates, Tigris, and Karun flowed into the Persian Gulf by separate mouths. Those who wish to have a closer knowledge of the conditions of this intricate approach to Iraq and the great Euphrates–Tigris "corridor," I would refer to the observations I there make.

A pilot from Kharag or Bandar Rig comes aboard our steamer, takes charge with the easy and confident demeanour of pilots all the world over, and we steam across the bar, our course well marked out by lighted and unlighted buoys. Steamers of more than 23-feet draught are unable to cross the bar in either direction without recourse to lighterage, and must remain so until the proposed dredging of a channel, some 300 feet in bottom width, has been accomplished. Two hours later, or thereabout, we pass Fao, the cable station on the right bank of the Shatt where, in November 1914, our troops first landed, capturing

* Twenty-five open hands, placed side by side;

† *Geogr. Journ.*, 65, March 1925.

and dismantling the fort before pushing on to Basra, soaked in rain and half drowned in mud.

The right bank of the Shatt al Arab is a belt of palm trees, stretching almost without a break from Fao to Qurna; the left, or Persian bank, which is lower by comparison, is less cultivated. Two hours' steaming up the majestic stretches of the Shatt brings us to the great tank farm and jetties of the Anglo-Persian Oil Company at Bawarda and, a few minutes more, to Abadan. Then in less than an hour we reach the spot where the Karun river joins the Shatt on its left bank, with Mohammerah just round the bend. Still a few miles farther up stand two boundary pillars on the left bank, which mark the limit of Persian territory; thereafter we are in Iraq. Twelve miles more bring us to Basra, the home of Sindbad the Sailor, of "Bassorah dates" and of "Persian barley," and the last resting-place of thousands of gallant soldiers, British and Indian. Here our periplus comes to an end.

A few words in conclusion. In commencing this lecture I said the people of the Persian Gulf were not unworthy of admiration. May I trespass on your patience to say something on the subject to those who, like Sir Alfred C. Lyall, "strive to appreciate the native point of view, and to judge the people and their actions by their own standards, rather than by those of a white man living in their midst," or who, like Sir Hugh Clifford, love "brown humanity" and, having learnt something of the language and religion of an Eastern race, have accepted its social conventions, understanding something of its storied past?

Religion is an instinct and an aspiration and, even as a social institution of high utility, is not to be easily or safely uprooted, and will long be a mighty force among mankind. But Islam in these waters is rooted, like other religions elsewhere, in the older faiths: many of its shrines on the Persian side were places of pilgrimage before the teaching of Muhammad had replaced that of Zoroaster; the names of the epic heroes of pre-Islamic days—of Rustam, Zuhrab, and Zal; of Solomon, Bahram, and Qubad—are still on the lips of men, who have found for them a local habitation, with but little regard to the exigencies of archæology and history. Pictures of these national heroes, and of the saints of the Shiah hagiology, are no less popular to-day than they were a thousand years ago, and the European who would understand Persian or Arab pyschology must know something of the stories which may be seen stamped on almost every piece of brass or coloured cloth made on the spot.

The daily life of Persian and Arab alike has in it something of joy and light-heartedness which the acerbities of Islam has not quenched: the Persian prefers the hedonism of Hafiz to the philosophy of Sadi, and the unbending bigotry of the Shiah priesthood is agreeably tempered in the masses by the strain of mysticism which runs through their literature and, amongst the Arab tribesmen, by the sense of freedom which

comes naturally to them from their life in open spaces or amongst the eternal hills.

The dark shadow of a form of bondage akin to slavery falls over many pearl divers; heat and cold, hunger and thirst, vermin, pain, sickness, and death are to them, as they were to us all in Europe not so very long ago, and to very many during the Great War, a necessary part of life, not things to fear or avoid contact with, but things to face stoically and even light-heartedly, as the common lot of man. Those who have lived for many years in primitive lands among ancient peoples will understand the fascination which the Gulf has exercised over me; and those who have lived in Islamic countries will understand more easily than others why it is in the East that great religious were born, and why they enjoy, notwithstanding inevitable poverty and much misrule, a cultured stability which Europe has yet to attain.

Our final supremacy in these waters ushered in an era of freedom of trade, of commerce, and good feeling amongst peoples, notably between Arab ports and India, between whom no friendly intercourse previously existed. Amongst these peoples it is our privilege to exercise influence without dominion, to obtain trade without acquiring territory; successive generations of British officials and merchants have set their mark upon the Gulf without impairing the vigour of the local governments, whose precarious existence we have often assisted to maintain and have never destroyed.

Before the paper the PRESIDENT (Dr. D. G. HOGARTH) said: You probably all know Sir Arnold Wilson by name. He is going to speak to you about a very interesting and, in many ways, little-known region in which he has spent, I believe, fifteen years—fifteen years in what is, one way or another, the hottest place on the globe. He is going not to speak of particular research in that region, but to give you a general conspectus of the Persian Gulf, which he has perhaps more reason to know well than almost any other living man. He will describe to you its general features. Though Sir Arnold has been fifteen years in that part of the world, not much of that time has been spent upon the actual waters of the Gulf. I believe he held once a consular post in Mohammerah, and you may remember that he was British representative on the Turco-Persian Boundary Commission before the war—a Commission which I believe, as British representative, he came to run entirely, as indeed he has run a good many things since. In fact, he ran it so successfully in the matter of supplies that we can only suppose that by becoming a Director of the Anglo-Persian Oil Company, which he is at this moment, he missed the even more lucrative vocation of becoming a director of Messrs. Lyons! After that he did very great service in the war, and he was, at a time after the war, when Sir Percy Cox became Ambassador at Tehran, our chief Civil Representative in Iraq. In that capacity he had to do many and very difficult things, because he was there at the time of the post-war rising of certain tribes in that country. His name became a household word with every one who had to do with the Eastern theatre of the war, and still more with those who had to do with the difficult problems of that theatre in the first year or two of the peace. I think even those of us who have had some reason to be concerned with the Persian Gulf and

know something about its physical features will have a great deal to learn from the lecturer. I will now ask Sir Arnold Wilson to read his paper.

Sir Arnold Wilson then read the paper printed above, and a discussion followed.

Sir PERCY COX: I have spent the greater part of my lifetime in the sphere which is the subject of Sir Arnold Wilson's lecture to-night, and all the scenes are most familiar to me, so much so that I find it difficult to regard the lecture from a detached point of view; but he seems to me to have given us a most able and complete historical picture of the Gulf region and of our position there from time immemorial. Nowadays it is apt to be said that the Gulf has lost its importance, and perhaps it is that, as a result of the war, our position there seems so assured that it may have lost some of its interest. When I went to the Gulf in 1899 it was at the beginning of a period of extraordinary interest; that was before the South African War, before the *entente* with France, and at the moment when Russia was actively seeking to undermine our position there and to get to warm water. All British representatives in the Gulf at that time had a very difficult, interesting, and sometimes exciting task to keep their end up and to maintain our position there. I remember about 1900 the foreign rivalry which prevailed in the matter of sending ships to the Gulf. Admiral Slade, whom I see here to-night, will, I am sure, remember it, for he was Commander-in-Chief of the East India Station there during part of that period, and he knows how keen the competition was. Russia, when sending any large ship to China, would send her for a tour in the Gulf *en route*, perhaps a much bigger vessel than had ever been seen there before, and we had to go one better. Particularly I remember the case of the *Askold* coming up with five funnels, and it was a very difficult problem for us to compete with them. At last, however, one of Her Majesty's ships came up sporting, I think, a sham fifth funnel, and that disposed of the matter for the time!

Then, a little later, I had often a very difficult time with my foreign colleagues and foreign intriguers whose activities were much in evidence during the South African War. One was attacked in every weekly rag that came to the Gulf, and the paragraphs were as personal as they could be. I remember one gentleman saying, "The methods of Major Cox are as crooked as his nose." That always remains in my memory, if it did not stick in my gizzard. After that we had several years of very hard work combating the arms traffic, which furnished the Navy with a difficult task. We spent, I should think, three-quarters of a million on the suppression of the traffic. Now there is practically no such traffic, but at that time arms went in enormous quantities to the North-West Frontier and Afghanistan, emanating mainly from French and Belgian factories and even from our own, because the trade was open by treaty. Thanks however to our vigilant supervision, the traffic is a thing of the past, and is practically non-existent now.

During the war one heard a good deal of the "Mesopotamian adventure" and of the "side-show" that we were running there, but I ask you, now that Mesopotamia is fairly settled, to consider what would have happened if we had not promptly taken up the gauntlet with Turkey, at the head of the Gulf, at the beginning of the war. Things would have taken a very different turn in that sphere, and we should have had endless trouble. We might eventually, having won the war in the West, have recovered part of our position in these waters, but we should have lost all our staunch friends in the meanwhile. I doubt whether we should ever have retained the position we hold now but for

the fact that we had gone at the very beginning of the war to the support of our friends and interests at the head of the Gulf.

In conclusion, I would like to ask the lecturer one or two questions. I always understood that it was accepted that the mounds at Bahrain were built during the lifetime of the occupant, and that he was dropped in at the top when he died. I do not quite see how that could be the case if corpses were brought on pilgrimage from distant countries, as Sir Arnold suggests. Secondly, is there any recent news as to how the dredging of the Fao Bar is progressing? Is it going on actively, and, if so, ships of what sort of draught can now get over it?

Admiral Sir EDMOND SLADE: I am afraid I cannot claim as long acquaintance with the Gulf as either the lecturer or Sir Percy Cox, but I did know the Gulf fairly well during the three years that I was in India. There is one point in regard to which I rather want to traverse what the lecturer said: it is a point which everybody makes, namely, that the Gulf has a beastly climate. I quite agree, but that beastly climate lasts, comparatively speaking, for a short period of the year. The remainder of the year the climate is not at all bad. I have seen snow lying on the low ground at Bushire, and I have seen ice on the borders of the Shatt al Arab; I will admit that I have also seen the thermometer standing, at the same place, somewhere between 120° and 128° in the shade. But there is plenty of choice, and really for six months, or even seven, the climate is quite passable.

There is another point which I would like to bring to your notice, and that is the scenery in the Gulf. You have no idea how fascinating the Persian mountains can look, particularly towards sunset or just after sunset. The colours of the mountains are exquisite. The outline is fantastic, and towards sunset the mountains take on a most glorious rose colour which, as the sun drops towards the horizon, becomes a lovely purple, and then, as the sun disappears, suddenly turns to a deep indigo. I do not know any part of the world in which there are such glorious effects of light, colour, and shade, except perhaps on some of the Greek islands and the coast of Greece.

Then there is another place, Hormuz, which has always interested me extremely in the Gulf. There on an island which is absolutely barren—which is coloured, one might say, with all the colours of the rainbow, for the top of the weird, fantastic mountain or hill which forms the background of the island is deep red; the sides are streaked with red, black, white, and brown; the streams (there are a few) which come down are all edged with white which looks like snow or ice, but is only salt—at the bottom of the narrow strip of land between the sea and the mountain are the remains of what was once a really magnificent town. You can see the streets and walk up them. They are narrow and tortuous, but the houses are clearly marked, and you can imagine what a magnificent city it must have been in years gone by. But how did that city come to be, and how did its inhabitants procure their food and water? There is none on the island; practically nothing grows, except a few scrubby palms. On the mainland about 3 miles away there is water, but it has to be carried across the sea. Eastward there is a rich district which probably, to a great extent, provided the food for the people on the island in the old days. There is also a cultivated district on the islands of Qishm and Larak, but they are a long way away, and communication in those far-off days must have been extremely difficult.

Bandar Abbas, which was the successor of Hormuz, was for a time a very important place. Ships cannot now approach the shore, but in the days to

come, when Persia has her railways and Bandar Abbas will again become a place of great importance, the question will arise as to how the ships can communicate with the shore. Bandar Abbas has more than once, I believe, shifted its site, and there is no reason, as far as I can see, why it should not again do so. If it is moved to a site some 12 miles to the westward of where it is now, it will be possible to build the town on a spot which ships can approach to within half a mile in deep water. The provision of docks and quays would be comparatively easy.

Sir ARNOLD WILSON, in replying, said: I will not attempt to enter into archæological controversy: we cannot usefully discuss the tumuli at Bahrain until Mr. Mackay's information is available to the public. I hope that it may be published before long. As regards the question of the bar, we are now at 23 feet. The work is undertaken by the Port Directorate of the Iraq Government. We hope to be down to 24 or 25 feet within the next few months. It is a very notable achievement, seeing that the bar was 18 feet two years ago. The work will make an enormous difference to the port of Abadan, and, incidentally, it will enable ships to get in and out of Basra very much deeper laden than before.

As regards the climate, I must plead guilty to Admiral Slade's charge, but I only quoted other people. I have expressed no opinion myself: if I quoted what British seamen under Sir Edmond Slade used to say it would be the reverse of complimentary. It is quite true that for seven months the climate is charming. I have spent nearly eighteen years in the Persian Gulf, and Sir Percy Cox nearly thirty years. We are, if I may say so, living examples of how little harm the climate can do to a European. But the fact remains that it is bad for five months. If you put a fish into water and boil it for only five minutes, it is no consolation to the fish to know it will only be hot for five minutes. We have made enormous strides in the matter of health in the Persian Gulf in the last ten years, not only in regard to ice and electric light and fans, which do not really greatly affect health, in my opinion, though they add to comfort and to enjoyment of life. The health of ships' crews has been improved by the regular supply to men on board ship of fresh vegetables as well as rum and lime juice, and on shore by greater care to sanitary conditions.

As regards scenery, I sincerely agree with every word Admiral Slade has said, but he must remember that he saw those Persian hills from his quarter-deck. I had to see them whilst wandering on my flat feet, and the sight was not always equally inspiring.

The water question at Hormuz is not so puzzling as might be thought. It is perfectly true that there is no water fit to drink there. But Kuwait, which is a prosperous town of some 30,000 or 40,000 souls, gets the whole of its water from Shatt al Arab, 30 miles away, in open boats; yet the place is extraordinarily healthy, presumably owing to the absence of stagnant water. Qais is another case in point. These places depended, as Kuwait does to-day, not merely for water but for everything, upon imports. Another example is Bombay, once a barren island, which now supports a population of a million or so depending on water coming from 50 miles away, and food from anything from 50 to 500 miles.

The PRESIDENT: Sir Arnold Wilson's lecture has fulfilled the promise which I ventured to make, that it would be an admirable general survey of the Gulf from many and various points of view. Although he did not describe any original research of his own or speak much of research, he indicated that there were certain points in connection with the Gulf, socially and archæo-

logically, upon which considerable research might profitably be done. I do not know in what way Mr. Thomas, whom he mentioned, has dealt with those curious people of the Musandam promontory. I imagine it is by personal visit; and in any case we may wish him all possible success in such research, because there is no more interesting survival than those people. They are almost certainly a part of what is left of the pre-Semitic people of Arabia; like the people of Dhofar and those beyond them on the west. There are three regions, at any rate, in which we seem to have remnants of the people who really began human history in that part of the globe—the pre-Semitic inhabitants. Archæologically, also, there is no doubt a very great deal to be done. That one dig which was undertaken by the French Susa Mission upon the Persian side of the Gulf has only just tapped a very large field at one point.

As regards Bahrain—I have spoken of it before. I have not much hope that Mr. Mackay's explorations will solve the mystery. It appears to be insoluble. There is extraordinary contrast between the immense size of the mounds and the extreme poverty of any remains inside them. They are not at all like burials in any other part of the world or in any other district of that part of the world; unlike Babylonian, Sumerian, or Assyrian burials. Moreover, the little fragment of an ivory statue which was found there does not seem to me to have anything like the antiquity claimed for it. It is like the work of the very end of the Assyrian kingdom, about the seventh century before Christ. I have not seen the spear-head which Mr. Mackay has found, and I should like to reserve my judgment about its being so old as 1200 B.C. Again, I do not feel at all clear about the probability of Sir Flinders Petrie's theory that transport of corpses from the mainland coast of Arabia to Bahrain supplies an explanation of that large cemetery there. Gerra could not have been a big place; in fact, if the remains near Ajer are really those of Gerra, they prove that it was, in fact, not a large place nor a place which had much civilization. I should think that it would have been far more likely that the higher civilization, and the really important place of commerce in antiquity, was on the Bahrain islands, and that those tumuli are the cemetery of ancient towns which existed on the Bahrain islands and have now disappeared. However, it is too late to go into archæological questions in regard to the Gulf. I will only ask you to signify your thanks to Sir Arnold Wilson for his clear and comprehensive picture of a region exceedingly well known by name. Probably we all feel that we know far more of it at this moment than we did about an hour and a half ago!

DECORATIVE ATLASES

Old Decorative Maps and Charts.— Arthur L. Humphreys, F.S.A., with Illustrations from Engravings in the Macpherson Collection and a Catalogue of the Atlases, etc., in the collection, by **Henry Stevens.** London: Halton & Truscott Smith, Ltd. 1926. 12 × 10, pp. viii. + 51 + xlii. *Seventy-nine Plates, of which nineteen in colour.* 3 *guineas net.*

THE author of this fine and attractive book takes a collector's pleasure in recording the very great rise in price of the better examples of engraved maps and atlases during the last few years. They are being "sought for and hunted down both for the story of exploration and discovery and for their beauty of ornamentation, their rich colouring, their bits of costume and heraldry, and for the amount of very evident soul which their designers and engravers put

into their execution." In the last three years the value of Speed's Atlas has increased by leaps and bounds, he tells us, and as indeed we had occasion to know only a few months ago, when buying two editions for the Society's collection. But " Speed's maps are rarely found with contemporary colouring. Nearly all Speed's maps now sold are coloured skilfully, it is true, but by present-day colourists." So we may be content that our newly acquired copies were uncoloured.

The nineteen coloured plates are reproduced by the four-colour process, on loaded " art " paper, and with scale a good deal reduced. It looks at first sight as if the colour plates might have been prepared by hand, by a process of stopping out in which most of the engraved black lines had been lost in the decorative parts : but closer examination shows that this effect is due to the heavy opaque colour in which the original engravings have been painted up. Within the limitations of the process and the paper, the reproductions are good : but they have necessarily lost all the character of the originals. If the colour of the original were important, as colour, this would be a grave disadvantage ; but we think that it is fair to say that in general the colour put upon these engraved maps by the producers of them was more often a disfigurement than an adornment. The celebrated title-page of Saxton's Atlas, with the engraved portrait of Queen Elizabeth, is a case in point. The uncoloured plate is reproduced by Mr. Sidney Colvin among his masterpieces of English engraving. The colourist, with his thick washes of opaque colour, has ruined the beauty of the copperplate engraving without making anything worth looking at as colour. Apart from a certain superficial attractiveness of the gay heraldry, and the evident practical advantage of having political boundaries brought out by ribbons of colour, there is from the artistic side nothing to be said for painting on copperplate engravings. It seems therefore to be doubly unfortunate that a present fashion for collecting coloured maps should have led to fraudulent damage of much beautiful work.

It appears from the title of the work that all the seventy-nine plates, in colour or in black, are reproduced from the rich collection of Mr. Macpherson. A descriptive catalogue of this collection, by Mr. Henry Stevens, makes a valuable addition to the book ; but only the atlases, not the single maps in the collection, are catalogued. It might have been better to call the book " Old Decorative Engraved Atlases," for although they are treated to some slight extent in the text, neither manuscript portolan charts, which are by far the most decorative of all, nor large engraved wall maps, such as the masterpieces of Hondius and Blaeu which adorn the Map Room of the Society, have any place in the reproductions. Every one will agree with the author that " to-day there is room for maps which combine accuracy, symbolism, and colour in a way hardly dreamed of even by the great Dutch cartographers." But we think that success will come, not by adding colour to a black original, but by designing the whole thing in colour from the start, in the style of the famous Catalan map of the Bibliothèque Nationale or the rather less well-known but more beautiful Este World-Map in the library at Modena. Not so sumptuous, but with a more delicate and refined beauty all their own, are the best of the portolan charts at Florence and Venice and Parma. None of these have ever yet been reproduced adequately in colour, and the difficulties are not small ; but we have the best of reasons for hoping that they may soon be overcome, and that a small series of the finest will be made available for the delight of the student, or, what is more important still, for the instruction and inspiration of the future cartographer, who has much to unlearn from the present.

In designing a decorative map, colour is perhaps not the principal difficulty. The mapmakers of the best periods, whose work is so abundantly and beautifully illustrated, though on a reduced scale, in the book under review, abandoned the pleasant mediæval habit of drawing fine cities with towers and banners on the land, but filled the sea with ships and mermaids and marine monsters. We have yet to find an artist who can make equally decorative effect with the modern monsters that inhabit the sea, and the sham-antique of some few modern decorative maps is deplorable. There should be something to be done with a decorative treatment of natural features in wall maps where much detail is best avoided, but the map-artist will have to rely most on the wide resources of fine lettering for his effects. In the present collection there is excellent stuff for study in the larger names, though one may regret that there is relatively little fine Roman lettering; a plate or two from the Rome edition of Ptolemy that is in the Macpherson collection would have been valuable. The considerable reduction that the plates have suffered makes them of less use for the smaller characters, which want magnification rather than diminution if their beauty is to be seen and their finer variety appreciated. Some day we may hope to see a collection of full-size collotype reproduction of select bits of lettering, ornament, and conventional signs—even of alphabets reconstructed from the work of the greatest masters, after the style of the patterns which Hondius himself published in his little book on writing.

Within its limits, however—the map engraved on copper and coloured by hand with rather solid paint—the present collection is excellent. It gives a good idea of what the sixteenth and seventeenth century engravers achieved, and of what we may admire in their work; while if we can avoid being carried away by the rather undiscriminating enthusiasm of the author we may even learn what to avoid—the abuse of strapwork, the over-employment of cupids as supporters in heraldry, or the inset of plans and perspectives. A very important part of the decorative map is its frame, and 'tis a pity that some of the plates have been mercilessly trimmed so that the frame is lost.

There are points in the introductory text that seem open to criticism, but we need mention only one. Mr. Humphreys speaks twice of the famous Fra Mauro map as painted on a wall in Venice. So far as one can see it in its deep case of glass in the rather obscure corner of the Biblioteca Marciana to which it has recently been removed from the Ducal Palace, it looks like parchment laid down on wood, with a circular frame to the map proper carved in high relief and gilt, and subsidiary devices in the spandrels outside the circle. Is it possible that the author is confusing the Fra Mauro map with the wall paintings of Giacomo Gastaldi in the Sala dello Scudo, where or close by, if we remember aright, the former was shown until recently?

There is a curious mistake in the title of plate 70, a star map from Van Keulen's atlas of 1709. It is not of the Northern Hemisphere, as stated, but the whole sky plotted on the *plate carrée* projection, peculiarly unsuited to a star map. And it should be noted that the preceding plate, entitled "Star Chart for the Southern Hemisphere," is for the sky south of the Ecliptic, not of the Equator.

A. R. H.

RECENT RUSSIAN ARCHÆOLOGICAL EXPLORATION

DURING the last four years there has been a considerable revival of archæological activity throughout the Soviet Union. The progress of the various expeditions is reported from time to time in *Novi Vostok* (the New East), a periodical publication of the All-Russian Association of Oriental Studies, fifteen volumes of which—some bound together—have appeared to date. Since these explorations have geographical as well as antiquarian interest, and the Russian accounts are not easily accessible to geographers, a brief summary may be useful.

Novi Vostok, Nos. 10–11, gives a brief account of Colonel P. K. Kozlov's expedition to Northern Mongolia under the auspices of the Russian Geographical Society, and this has been supplemented by a publication from the Russian Academy of Sciences—'Kratkie otcheti ekspeditsi po issledovaniyu Severnoi Mongolii v svyazi s Mongolo-Tibetskoi Ekspeditsiei P. K. Kozlova' ('Short Reports on the Expeditions to Northern Mongolia associated with the Mongolo-Tibetan Expedition of P. K. Kozlov'), St. Petersburg, 1925, fifty-eight pages, with photographs and plans. A full account will be published at a later date by the recently founded Russian Academy History of Material Culture.

The Kozlov Expedition * arrived in Urga in November 1923, with the object of carrying out explorations far to the south of that city, but "in view of unforeseen difficulties" the programme was altered, and Colonel Kozlov organized a number of excursions for the exploration of places in the immediate vicinity of Urga. Work was begun in February 1924 on three separate groups of tumuli, 212 in all, situated in three small lateral valleys which intersect the wooded slopes of the Noin-Ulla Mountains, about 80 miles to the north of Urga. The tombs had been looted at some previous date by robbers, but nevertheless rich finds were made of miscellaneous objects in gold, lacquer, bronze, and iron, and, in company with human remains, tissues of silk, felt carpets, and remnants of fur robes and of horse-trappings were recovered. The cultural and historical significance of these finds is reviewed in a report by Mr. G. I. Borovka, included in the publication of the Russian Academy of Sciences. An approximate age of 2000 years is attributed to the culture revealed in the mounds of Noin-Ulla, and Mr. Borovka indicates that it was of a definitely "Scytho-Siberian" character. He regards this "Scytho-Siberian" culture as being intermediate between the Hellenic civilization of the Black Sea region, and the contemporary civilizations of Achæmenian Persia, and of Hân China; and he concludes from the finds at Noin-Ulla that this intermediary "Scytho-Siberian" culture certainly extended over Northern Mongolia. Chinese influence is emphasized in a series of objects which were undoubtedly imported direct from China, such as quantities of silk tissues, with or without embroidered ornaments, and many lacquered objects. Mr. Borovka stresses the importance of the Scytho-Siberian culture, not only as a receptive intermediary between the Hellenic and Iranian civilization and China, but as a creative influence which has affected the development of both European and Far Eastern art.

Novi Vostok, No. 12 (pp. 343–5) gives a short report of excavations made by Prof. V. Smolin in the summer of 1925, in the vicinity of Abashevo, 18 versts from Cheboksari, the capital of the Autonomous Chuvash Soviet Socialist

* A brief note on this expedition was given in the *Geogr. Jour.*, 68 (1926), p. 170.

Republic which lies along both banks of the Volga between Nijni Novgorod and Kazan. Professor Smolin concludes from the finds that "the archaic character of the ceramics, spirals, and of the weighted ear-rings of silver, tin-plate, etc., refer to the epoch of the Second Millennium before our era. The material of the Abashevo tomb appears to be contemporary with the antiquities of the Caucasus, particularly of the Terek Province (village of Faskaü, etc.). The finds at Abashevo open up a wide perspective, and introduce completely new elements into the study of the cultured affinities of the Kama–Volga basin."

In the summer of 1924, G. Bonch-Osmolovski, on behalf of the Ethnographic Section of the Russian Museum, continued explorations already started in 1923 in the mountain districts of the Crimea (*Novi Vostok*, No. 8–9, pp. 391–3). Excavations were undertaken at the cave of Kiik-Koba, near the village of Kipchak, which is in the vicinity of Simferopol. Osmolovski states that "the stratigraphic condition of the find does not leave any doubt as to its Quaternary age." Under the top black stratum appeared a thin brown stratum, under which lay the Quaternary yellow clay. In this mass were found the remains of two hearths, separated from each other by an intervening stratum. The lower hearth was laid out actually on the rocky bottom of the cave. In each of the two "hearth" strata were found the bones of fossilized (iskopæmiy) animals, flint shavings, and implements. These are stated to be the remains of mammoth, rhinoceros, deer, antelope, and other animals.

He goes on to state that the flints of the upper and lower strata are to be sharply distinguished, in point of quantity, colour, pattern, and technique of workmanship.

In the "lower hearth" stratum of Kiik-Koba were found the bones of two human skeletons of an adult and of a child. The bones of the adult lay in a hole of rectangular form, which had evidently been excavated in the rocky floor of the cave. The situation of the grave was almost in the middle of the cave, and it was orientated from east to west. The corpse had been laid on its right side, with the knees slightly drawn up.

Osmolovski makes the following preliminary conclusions: (1) In the cave of Kiik-Koba there are two distinct cultural strata, divided by a great interval of time, but genetically related. (2) In cultural chronology the lower stratum must be related to the early Palæolithic; the upper to the end of the early or to the beginning of the Middle. (3) The contemporary relationship of the cultures of the Kiik-Koba cave to the corresponding cultures of the west cannot at present be determined, through lack of knowledge of the sequence of types of fauna in the Crimea. (4) The remains of man, undubitably buried artificially, relate to the period of the lower stratum. Although having points of similarity with the Neanderthal man, they appear to be a little more primitive.

Other Russian archæological activities have covered the Tatar (Kazan) Republic, the Governments of Samara and Saratov and the Caucasus. Important contributions to the knowledge of the history of the Greco-Roman period in South Russia are the excavations of Prof. Farmakovski on the site of Olbia, and of Prof. Borozdin on the site of the Crimean Herakleia (*Novi Vostok*, No. 7). Prof. Borozdin has also carried out excavations at Solkhat and Eski-Yurt in the Crimea (*Ib.*, Nos. 8–9 and 13–14), which, together with Professors Ballod's and Rikov's work in the Volga region (*Ib.*, Nos. 3 and 6) contribute to throw much new light upon the mediæval culture of the Tatar Khanates of Southern and Eastern Russia. In the Caucasus, possibly the most interesting field of all, no serious work has been done. The expedition of

Professors Yakovlev and Baklanov to Daghestan was little more than a reconnaissance, although the discovery of interesting traces of Sassanian influence is recorded (*Ib.*, No. 5). Excavations have also been undertaken at Sukhum, in the Abkhazian Republic, on the sites of Byzantine, mediæval Georgian, Genoese, and Turkish ruins. The discovery of bronze instruments at both Mtzkhetha and Signakh was reported last summer in the Tiflis Press, and of remains, alleged to be Urartian, in the Qarabagh mountains, but nothing serious has been published with regard to these finds.

In connection with the Kiik-Koba excavations, it is interesting to recall the only find of palæolithic remains made in the Caucasus (with the exception of five elephants' teeth, two of *Elephas antiquus* and three of *Elephas primogenius*, made at different places in Daghestan, Terek, and Abkhazia, and now deposited in the Tiflis Museum). In 1880 at Rgani, now Satcheri on the Kvirila, some manganese workers discovered a cave containing a mass of bones which had been charred by the action of fire. The dispersion of the bones by sale as lucky talismans among the villagers prevented a scientific examination of this find, and it remains doubtful whether human remains were mingled in the *débris* (' Chantre: Recherches anthropologiques dans le Caucase,' vol. 1, p. 43). W. E. D. ALLEN.

REVIEWS

EUROPE

Lost London: being a description of Landmarks which have disappeared pictured by **J. Crowther** *circa* 1879–87, and described by **E. Beresford Chancellor.**— London: Constable & Co. 1926. 10½ × 8, pp. xiii. + 131. *Sixty full-page Illustrations, twenty-four in Colour.* £3 3*s.*

Original Views of London as it is, by Thomas Shotter Boys, 1842.— With descriptive notes by **E. Beresford Chancellor.** London: The Architectural Press. 1926. 12½ × 9¾, pp. xv. + 111. 30*s. net.*

THESE two well-produced works are further evidence of the growing interest in " old " London. They are, as it happens, to a large extent complementary—a circumstance probably not fortuitous, though they are separated by a period of nearly half a century. Crowther's drawings, executed in the 'eighties, are of buildings which were then considered in danger of destruction. The drawings were very numerous, though only a selection are reproduced here. It would perhaps be too much to say that this selection hardly deals with London at all, but they are in fact confined to Chelsea, Westminster, Whitehall, the Strand, the Borough, and Vauxhall. It seems likely however that more will be forthcoming, though not definitely promised. In the mean time they are supplemented by Boys' work, which includes most of the great buildings of London irrespective of their probable fate. Both artists, while maintaining topographical accuracy, show appreciation of the pictorial merits of each scene. Boys, in addition, has included something of the contemporary life of the streets.

These volumes will bring some comfort to the student of old London. With the exception of a portion of the Bank and Northumberland House, none of the greater buildings depicted here have totally disappeared. Some have altered to a greater or less extent, and some, as at Hyde Park Corner, have been rearranged; but it is rather their settings that have been transformed. This is brought out especially by Crowther's plates. The chief victims have

been the rambling rows of small shops and dwellinghouses, picturesque, it is true, but surely not always so charming as the artist's brush depicts them. They must now be sought in the small towns and villages on the city's fringe. It is interesting in Crowther's scenes to note how each area presents definite characteristics: we have the almshouses and charity schools of Westminster; the narrow courts and passages between the Strand and the River; the old Inns of Southwark. The last form a particularly interesting group. One could almost wish that Boys too had directed his attention to the byeways. Now that the threats to the City churches and to Waterloo Bridge have been removed, it would seem as if the Londoners of 1975 may have to lament no greater losses.

It would be ungenerous not to mention the fact that Crowther's work was commissioned by the late Sir C. E. H. Chadwyck-Healey, who thus very practically demonstrated his affection for the City. The texts by Mr. Beresford Chancellor display a wide knowledge of topographical detail and much enthusiasm for the subject, but at times tend to diffuseness. G. R. C.

Primitive Culture in Italy.— **H. J. Rose, M.A.,** Professor of Latin, University College of Wales, Aberystwyth. London: Methuen. 1926. $7\frac{1}{2} \times 5$, pp. ix. + 253. *7s. 6d. net.*

This is a companion volume to the author's 'Primitive Culture of Greece,' published in 1925, and applies the same methods to answer the question, to what extent any characteristic features of savage life and thought survived into the historic civilization of the Romans and other peoples of ancient Italy? This is not a topic which admits of much geographical commentary, partly because so little is known of early Italy outside the range of Roman influence and information, and consequently so few customs can be assigned a geographical distribution; partly because in many essential respects old Italian culture was continuous from the Apennines to Sicily, however modified in detail, and especially in the material arts, by contact with other cultures overseas. Yet it may be suggested that local variations of custom might be more closely connected with local differences of environment, than is attempted here; there is not, for example, much insistence on the great contrast between highland and lowland peoples, which dominates early Italian history, and sometimes cuts across the contrast between tribes of *p*-using and *q*-using dialects.

Within the strictly ethnographic limits which Professor Rose has set himself, however, there is little to criticize, and much to admire in his concise, lucid, and most readable survey of a subject of which the literature is copious and scattered, and the evidence necessarily gathered from many sources of information. The opening chapters on simple societies generally, and on the relations between race, religion, and material culture in Italy are excellent: the receptivity of the early population is rightly emphasized, in contrast with the bold originality of the Greeks; and the varied sources of foreign influence are estimated with the wide knowledge and scholarly criticism which were conspicuous in Professor Rose's earlier volume. This is a book which, for all its modest appearance, and easy price, will be found a real help to students of ancient history and antiquities. At the end is a convenient list of relevant books; and there is a very serviceable index. J. L. M.

Étude Tectonique et Morphologique de la Provence Cristalline.— **Léon Lutaud.** (Revue de Géographie Annuelle. Tome Douzième. Année

1924.) Paris: Librairie Delagrave. 1924. 7 × 9, pp. 71 + 15. *Twenty-one Figures, sixteen Plates.*

This volume comprises the results of a regional study of the Geology and Morphology of that part of Provence which is composed chiefly of crystalline rocks. The treatment is full and careful. The author has been critical in the use of his material, and acknowledges amply his debt to previous writers. The volume is illustrated by several good photographs and many maps. Those maps showing tectonic structures are clear, but some of the topographical maps are confused.

The treatment is mainly geological. In his preface the author writes: "Il est vrai que personellement, je ne reconnais point que la géographie physique soit à proprement parler une science indépendante; telle que je la conçois, elle n'est qu'une branche de la géologie. . . ." Doubtless this will be contested by many geographers, but whatever view is taken, the author, so far as the present work is concerned, has certainly carried his belief into practice.

The volume is divided into two parts: the first dealing with the geology and tectonics, the second with the morphology.

Geologically, the area consists of three "Massifs Cristallophylliens" separated by two synclinal areas in which Permian rocks occur. The north-eastern massif is the Tanneron, the central, Maures, and the south-western, Cap Sicié. This last is, for the most part, below sea-level. It consists largely of a zone overthrust to the north—the *Nappe de Sicié*. The main series of thrusts, which all run more or less east-west, and so oblique to the axis of the region, occur in the Maures, the western part of which is an area of typical imbricate structure. The direction of thrusting is mainly to the north, although examples are found showing a southerly movement. Thrust-structures are absent from the Tanneron—thus supporting the author's contention that the orogenic forces weakened to the north-east. The main movements are all of Pyrenean age: later movements have had much smaller effects.

The present topography of Provence appears to be the outcome of two main cycles of erosion. The first was completed before the Plaisancian (Lower Pliocene); the second is not yet completed. The controlling influence of the Pyrenean movements is still discernible.

The remarks on Raised Beaches are interesting mainly in their bearing on the general question of the formation of the Mediterranean beaches. Remains occur corresponding to the Milaggian, Tyrhennian and Monastirian episodes of Déperet. The author shows that their present distribution in Provence itself indicates a tilting movement, which depressed the south and west and uplifted the north and east parts of the region. Simple Eustatic movements cannot be appealed to in this case.

The volume closes with a chapter entitled "Sur certaines formes du terrain du Cantal attribuées à la deflation," written conjointly by Y. Boisse de Black and P. Marty. It is illustrated by six figures. There are useful bibliographies of literature and maps. Unfortunately there is no index.

J. A. S.

A Wanderer in Rome.— E. V. Lucas. London: Methuen & Co. 1926. 7¾ × 5¼, pp. xv. + 246. *Sixteen Illustrations in Colour, thirty-six Reproductions from Photographs, and a Picture-map.* 10*s.* 6*d. net.*

The latest addition to Mr. Lucas's 'Wanderer' series is less successful than some of its predecessors; the author does not know Rome as he knows

London, and his book frequently betrays his lack of intimacy with his subject. The chief point of this kind of travelling companion is to furnish one with those small but important pieces of information that every intelligent person wants to possess and that Baedeker always forgets to mention: such as the places where you will find the best *filetto alla bolognese*, the most perfect Orvieto. Mr. Lucas, usually sound enough in matters of eating and drinking, seems to have heard of no Roman restaurant but the Ulpia, which—to say the least—is unenterprising. Unhelpful in these small details, he is apt to be unreliable in matters of more consequence. The mistakes, which are unhappily rather frequent, are sometimes caused by hasty inferences (such as that, because *nympha* means a bride, *nymphæum* must mean a "marriage-hall," whatever that may be; actually it means a conservatory); sometimes they are due to inaccurate recollection (the Capitoline Faun is not a copy of statue by Praxiteles at the Villa d'Este; the Praxitelean original has not survived: the Capitoline figure, a Roman copy, itself came from the Villa d'Este); sometimes they are the result of an uncritical dependence on authority (we are sorry to find that Mr. Lucas has given a new lease of life to that old superstition about the Colosseum having originally been cased in marble; two minutes' examination of the capitals and mouldings are enough to dispose of the misconception for ever). These may seem small points; but since originality can hardly be expected of one who is bold enough to add to the pile of Roman guide-books, now grown so large that it may fairly be described as the city's eighth hill, we have at least the right to demand accuracy. Mistakes apart, Mr. Lucas writes with his usual slightly mechanical facility, which is admirably partnered by Mr. Morley's accomplished if superficial water-colours. R. H.

Rome: Past and Present.— Text by **William Gaunt.** London: "The Studio." 1926. $11\frac{3}{4} \times 8\frac{1}{4}$, pp. xi. + 27. 144 *Plates, of which seven are in Colour.* 10*s.* 6*d. net.*

Ever since it occurred to artists, about the end of the fifteenth century, to draw views and prospects for their own sake, and not simply as backgrounds to their figure compositions, Rome has never ceased to exercise a powerful attraction upon the imagination of topographical draughtsmen. The reawakened historical sense of the Renaissance had invested Rome, as the centre of the ancient world it so idolatrously admired, with an immense prestige which was naturally confirmed and augmented by the contemporary power and reputation of the Papacy. In Rome alone could the all-important relics of antiquity be studied and digested, and to Rome came every artist to be educated. At first they used its ruins and monuments as a sort of repertory of classical effects to be introduced as hallmarks of their culture. Later on, about the middle of the seventeenth century, they learned to love Rome for its picturesque qualities; early evidences of this more specifically topographical enthusiasm are to be found in the Velasquez sketches of the Villa Medici and the innumerable views of Rome and the Campagna drawn by Claude and his Italian contemporaries, all of which show the antiquarian interest as subordinate to the love of natural scenery. In the eighteenth century, with the arrival of Pannini and Piranesi, an attempt was made to reconcile the more critical and serious interest in antiquity stimulated by the researches of Winckelmann with the mania for the picturesque and for genre scenes which still possessed the cultivated patrons of art; but the two aims were found to be incompatible. Thenceforth art and archæology parted company, the artist resigning all claims to be considered as an antiquary, and the archæologist austerely dispensing with the irrelevant attractions of art.

The plates in the above work, which illustrate these various phases, are on the whole well reproduced and well chosen; the productions of our contemporaries make a poor show beside Claude and Piranesi, Turner and Corot, but serious artists appear to be interested no longer in topographical delineation. The accompanying text is relevant and well informed, if at times a little too lyrical in tone. R. H.

Peuples et Nations des Balkans.— Jacques Ancel. Paris: Armand Colin. 1926. $6\frac{1}{2} \times 4\frac{1}{4}$, pp. 220. *Maps.* 7 *frs. plus* 20 *per cent. increase.*

The "Collection Armand Colin," to which this book belongs, is a series comparable to the "Home University Library" in this country. The book is described by its author in his preface as a study in political geography, and this is again defined as the art of discerning the constant, reciprocal action of the environment on political societies, and of such societies on the environment. The aim of the particular study is to make comprehensible, so far as existing knowledge permits, the apparently inexplicable and incoherent problems of the Near East, by showing that they have a geographical basis. The book has thus to be regarded as an attempt to survey a very wide field of knowledge within a strictly limited framework. The limitations are shown especially in the size—some 200 pages; the impossibility of adequate illustration—there are three outline sketch-maps only; the nature of the references, limited to a brief bibliographical note dealing only with books published in the French language on Balkan topics, general works being excluded. The absence of an index should perhaps not be added to this list, since the omission appears to be quasi-automatic with French publishers. Of the sketch-maps it need only be said that in the two on which towns are marked, these—whether large or small—are shown by circles of the same size, beside each of which stands, with rare exceptions, a single initial letter. There are no references to maps or atlases in the bibliography. The book, according to the publishers' announcement, is within the reach of "toute personne cultivée." It would be a nice test of general education in this country to find how many persons could identify without hesitation all the towns so cryptically indicated.

These notes indicate both the breadth of the author's scheme and the bold policy of compression and omission by which he adapts it to the given conditions. From the general point of view, indeed, the book may be said to raise the whole question of the best method of popularizing knowledge in these days of high publishing costs. Frankly, we doubt whether any one could read M. Ancel's book with great profit unless he had already a fairly wide knowledge of the geography and history of the area discussed. But, on the other hand, the book gains enormously in vividness and grace by the author's assumption that the reader himself should be prepared to do the heavy spade work of preparing the way. It shows that elegance of phrasing, that logical development of a thesis, that broad outlook which we are accustomed to expect from French geographers, and affords a new proof that the French, and so far the French alone, have been wholly successful in making clear to the educated man the fact that geography can give help to those honestly desirous of understanding current problems. It is remarkably impartial throughout, and as against the common view that the Balkan peoples are semi-barbarians, constantly fighting for they know not what, it presents a clear picture of the forces behind the turmoil, and of the trends of social evolution discernible amidst the detailed tragedies of recent years. M. I. N.

La Grande Roumanie. Sa Structure économique, sociale, financière, politique, et particulièrement ses richesses.— C. G. Rommenhoeller, Consul général de Roumanie. La Haye: Martinus Nijhoff. 1926. 9½ × 6½, pp. viii. + 634. 6.50 *florins.*

In 1898 Mr. Rommenhoeller published, in French and in Dutch, an economic study of Romania which is of course now completely out of date. His present book is intended mainly for business men, and aims at giving a summary account of the natural wealth of the country and of the developments necessary before its resources can be fully utilized. It opens with a very incomplete sketch of the geography of the country, and there is no map of any kind. But if the geographer will learn nothing from this section, those dealing with the composition of the population, agriculture, agrarian reform, and peasant industries contain much of value to him. In particular there is an interesting discussion of the problem how far the immediate effects of the distribution of the land among the peasants—which have been admittedly unfavourable to production—are likely to be permanent, and the measures which can be adopted to carry the country over the difficult transition period. On the whole, however, the book may be said to be a compilation rather than a reasoned piece of work, and for the geographical reader at least its chief significance lies in the economic facts and statistics which it contains rather than in its argument and method of presentation. There is a good deal of repetition which swells the bulk of the book needlessly, no index is provided, and such references as are given are in footnotes to the pages, and thus not easy to find.

M. I. N.

ASIA

A Year among the Persians.— E. G. Browne. With a Memoir by Sir A. Denison Ross. New edition. Cambridge: University Press. 1926. 10 × 7, pp. xxiv. + 650. *Portrait and Map.* 25*s. net.*

A new edition of 'A Year Amongst the Persians,' with an excellent memoir by Sir Denison Ross, will afford pleasure to the late Professor Browne's many friends; it will also appeal to a wider circle. It is emphatically a book that can be read more than once, since it reveals Persian character and that at its best. When he visited Persia Browne was young, inexperienced, and had no official position, yet he was treated with extreme kindness and hospitality by Persians of every class, some of whom undoubtedly felt deep affection for him, which feeling he warmly reciprocated. In a sense, his youth and naïve belief in everything he was told made him fit in better with his Persian hosts than an older and more experienced man would have done, and the conversations he so conscientiously entered in his diary undoubtedly constitute the best part of his book. They reveal better than any other work the Persian mind in its dreamy mysticism, which is separated by a deep gulf from the strenuous West. Across this gulf Browne built a bridge, and then sat down permanently on the Persian side of it.

It is curious that the worldly side of his character never developed. His lack of judgment was just as great twenty years later, and, in the difficult and delicate questions of policy that confronted the British Government for many years before the Great War, he could never see any side but the Persian. As a Persian friend expressed it, he was more Iranian than the Iranians. On the other hand, from being steeped in Persian literature, Browne was able to write a monumental work on the subject that is the best in Europe.

His travels in Persia were along main caravan routes, from Tabriz to

Tehran and southwards to Isfahan and Shiraz. Everywhere his descriptions are vivid and culminate in a pæan of praise of Shiraz: "At our very feet, in a grassy, fertile plain girt with purple hills, and half concealed amidst gardens of dark stately cypresses, wherein the rose and the judas-tree in luxuriant abundance struggled with a host of other flowers for the mastery, sweet and beautiful in its garb of spring verdure, lay the home of Persian culture, the mother of Persian genius, the sanctuary of poetry and philosophy, Shiraz."

From this, his spiritual home, he marched to Yezd and Kerman, finally returning to Europe by the capital and Mazanderan.

The present reviewer hardly regards this delightful work as a "great Classic of Travel." For him it will rather remain a charming memorial of a friend, who gave him a copy of the first edition, and wrote in it the Persian couplet:

> "On the face of the earth there is no place like Kerman;
> Kerman is the heart of the world and we are men of heart."

P. M. S.

East of the Sun and West of the Moon.— **Theodore Roosevelt** and **Kermit Roosevelt.** London: Charles Scribner's Sons. 1926. 9 × 6, pp. xii. + 284. *Illustrations.* 16*s.*

We have here the record of a shooting trip organized on scientific lines in the Pamirs, Turkestan, and the Tian Shan mountains to secure various specimens of big game. The official name of the expedition was the "James Simpson-Roosevelts-Field Museum Expedition," and the members were the Roosevelt brothers and two other Americans. The party left Srinagar on 19 May 1925, and, passing through Leh and over the Karakoram pass, reached Yarkand on July 11. A month later the authors found themselves in the heart of the shooting-ground of the Tian Shan, where record ibex, *Ovis karelini*, and a fine specimen of the Tian Shan wapiti were obtained. The party then set off for the Pamirs, passing through Kashgar, in search of the famous *Ovis poli*. Having secured the necessary heads, they did not waste time, but returned to Srinagar by way of Hunza and Gilgit.

The scientific results of this expedition, when published, will be of much value to zoologists, for there is a study in progress to determine the course of migration of animal-life to the American continent. These results will form the final link, and naturalists should now have all the necessary data. It would also be interesting to study the intergradations of horns from the wide-spreading ones of the *Ovis poli* to the thick, close-curled ones of the *Ovis ammon* types. The photographs taken by Kermit Roosevelt are excellent, and there is also a good index. There are two sketch-maps which enable one to follow the route taken, and at the end of the book is an itinerary giving the daily mileage. A curious system of spelling of place-names runs through the book, and one would like to know why the altitudes, distances, and spelling as adopted by the Survey of India have not been used. B. K. F.

In Himalayan Tibet.— **A. Reeve Heber** and **Kathleen M. Heber.** London: Seeley, Service & Co. 1926. 9 × 6, pp. xvi. + 283. *Illustrations and Map.* 21*s. net.*

This book is based on the experiences of a twelve years' residence in Ladakh, and in this respect can be compared favourably with many other travel books. The authors are missionaries, and have therefore acquired a first-hand knowledge of the natives in the course of their duties. There are chapters on a variety of subjects, which include a poor historical account of Ladakh, some

descriptions of sports, industries, monasteries, and the mystery play at Hemis. Although the book is full of very interesting facts, yet they are thrown at the reader in a way which makes it impossible to appreciate them. There is not even a good index to act as a guide through this mass of information. The book is illustrated with a large number of photographs which cannot be said to have any very great merit. The spelling of place-names appears to follow no recognized system—an error that could have been easily overcome, as the Survey of India has recently published a revised Route Book which includes Ladakh and might surely be regarded as the standard authority on the spelling. There is a good map by Bartholomew at the end. It is a pity that the authors, with the qualifications they have, did not put their story into a more readable form, as it would then have been a valuable book of reference.

B. K. F.

A History of Assam.— Sir Edward Gait, K.C.S.I., C.I.E. Second Edition, Revised. Calcutta and Simla: Thacker, Spink & Co. 1926. $8\frac{3}{4} \times 5\frac{1}{4}$, pp. xiv. + 388. *Map and four Illustrations.* 25*s. net.*

This is the second edition of what is still the standard work on the subject: it is the only connected history of Assam from early times to the present day that we yet have. Of fresh matter there is but little. The only important epigraphical find during the past twenty years is the copper-plate inscription of Bhaskara Varman discovered in the Sylhet district in 1912. Archæological exploration, hitherto so superficially conducted in Assam, may yet enable us to identify places like Haruppesvara and Hamsakonchi, and elucidate many obscure periods.

Tradition and early history are dealt with succinctly. The chapter on the Koch kings is based upon a vernacular manuscript history of the Darrang rajas. Unfortunately, our knowledge of the earlier history of all the tribes originally speaking Bodo dialects is still very meagre. The special value of the work perhaps lies in the exhaustive and able summary of the history of the Ahom rulers, from their first entry into Upper Assam in 1228 through the vicissitudes of nearly six centuries of domination till their decadence and ultimate subjection by the Burmese about 1819. The original Ahom *buranjis*, or historical records, some of which had been translated for Dr. Wade in 1792–3, had never been critically examined and collated till Sir E. Gait assumed the task, and established the great historical value of these bark-inscribed documents. Useful accounts of the Kacharis, Jaintia kings, Manipur and Sylhet are added, with a description of the establishment and development to date of British rule. A separate chapter has appropriately been devoted to the growth of the Tea Industry.

Until little more than a century ago Assam was practically a *terra ignota* to Europeans. Leaving aside three or four older maps that possibly indicate certain features of, and sites in, Assam, the first map that records readily identifiable names is Lavanha's (*circa* 1550), on which are shown the "kingdoms" of "Comotah" and "Caor." Comotah clearly represents the Kamata of our history, and Caor probably stands for Kamarupa—the Kamru of Al Biruni and Husain Shah's coins, the Kamrud or the *Tabaqat-i-Nasiri*, the Kaonru of the *Ain-i-Akbari*, etc. Ramusio (1554) marks Comotay and Caor as towns; and thereafter during the next two centuries scores of maps show these names in various positions; but with the exception of the addition of a town Azo (*i.e.* Hajo), Assam above Goalpara is unrecognizable till the end of the eighteenth century, when the survey work of Wood, who accompanied Captain Welsh's military expedition of 1792–4, revealed the valley to

just beyond Garhgaon. Even Rennell, on his survey of the Brahmaputra, never got farther than 22 miles above Goalpara (December 1765).

Students of the history of this corner of India find much difficulty in determining with any approach to accuracy the limits of the dominion of the several dynasties that occupy the stage. The boundaries of ancient Kamarupa and mediæval Kamata are still obscure. Much depends on the courses taken by the Mahananda, Karatoya, and Tista from time to time, the determination of which is now difficult, if not impossible. Some writers indicate by means of maps the extent of sway of different empires or races at particular periods. However hypothetical the boundaries thus shown may be, such maps are of undoubted assistance. One of the chief defects of the volume under review is the want of a good map. The story of Assam cannot be properly understood without studying the physical features of the area—especially the great mountain masses that surround it on three sides, and the passes through them—that have exercised an all-important influence on the course of events : yet even the Himalaya mountains are not marked on the map given. An imaginary course is assigned to the Karatoya river, while the now more important river Tista is not shown at all ; and Ghoraghat is printed as if representing the *sarkar* of that name in Akbar's time : there has been no such district under our government. More detailed references to authorities utilized, and a good bibliography, would have enhanced the value of this useful work. C. E. A. W. O.

Natural Man. A Record from Borneo.— Dr. Charles Hose, with a Preface by **Professor Elliot Smith, F.R.S.** London : Macmillan & Co., Ltd. 1926. Pp. xvi. + 286. 127 *Illustrations and a Map showing the distribution of the Tribes.* 30*s. net.*

There could be nothing but praise for this beautifully produced book did it not suffer from one defect. That defect is one of omission, for Dr. Charles Hose has not made it sufficiently clear that the present volume is largely a recapitulation and abridgment of his former important work, ' The Pagan Tribes of Borneo,' which was written in collaboration with Dr. William McDougall and published in two volumes in 1912. Dr. Hose was over a quarter of a century in the Sarawak Government Service, and is now a member of the Sarawak State Advisory Council. In ' The Pagan Tribes of Borneo ' he recorded the fruits of his long and intimate association with the Sarawak natives, dealing with every phase of their cultural and social life, and the result was a monumental work which must remain the standard book on the Sarawak tribes. In that book Dr. Hose gave so fully and generously of his store of knowledge that it is not surprising that he should have little more to add. Yet the first impression a reader will receive on opening ' Natural Man ' is that it does contain fresh information. But a careful examination of the two works shows that little of importance has been added, and that the substance of ' Natural Man ' has been taken from ' The Pagan Tribes,' rearranged, abridged, and in places rewritten. Such a shortened form of Dr. Hose's previous great work is very welcome, just as the abridged form of ' The Golden Bough ' was welcome, but in the interests of students and scientists it should be plainly stated that those who, knowing ' The Pagan Tribes,' go to ' Natural Man ' in the expectation of finding fresh valuable information on the natives of Sarawak will be disappointed. Moreover, Dr. Hose has reproduced one or two errors which were inevitable to so vast a work ; as when he states that the Muruts do not use axes or blowpipes (' Natural Man,' p. 6, ' Pagan Tribes,' vol. **2**, p. 246) : whereas all the Murut tribes of North Borneo are adepts in making both.

For the reader unacquainted with Dr. Hose's previous work, however, 'Natural Man' will be a delight. It is a mine of information about the likeable inhabitants of the Sarawak hills and rivers, written lucidly and precisely, so that even those who are not professed anthropologists may derive both pleasure and profit from it. Dr. Hose does well to show that the primitive Sarawak natives are far from being "savages" in the ordinary sense of that word. They are kindly and hospitable, and crime is almost unknown amongst them. As Dr. Elliot Smith well says in his preface, "if his book achieves no other purpose than to establish the fact of fundamental importance that man is by nature peaceful and good-natured, Dr. Hose will have achieved a revolution in anthropological doctrine."

The book is accompanied by a good index. Some of the excellent photographs are reproduced from 'The Pagan Tribes,' but the map showing the distribution of the Sarawak tribes, compiled by the author, is new and is extremely valuable, though "Cape Data," the extreme western coastal point of Sarawak, is a misprint for "Cape Datu." O. R.

AMERICA

Maya and Mexican Art.— T. A. Joyce. London: The Studio. [1926.] 8½ × 6½, pp. 191. *Illustrations and Map.* 10*s.* 6*d. net.*

This beautifully produced handbook is one of a series issued under the auspices of *The Studio*, and the first glimpse of its pages offers a refreshing contrast to the familiar outlines of the artistic treasures of the Old World; especially remarkable is the coloured frontispiece, a slightly reduced facsimile of a page in the Zouche Codex, one of the finest of the few surviving Mexican manuscripts.

Mr. Joyce, whose labours in the field of early American archæology are well known, divides his new volume into seven sections, covering certain aspects of the culture of the races who so mysteriously rose to and fell from an amazing flower of civilization; he treats of architecture, sculpture, pottery, painting and draughtsmanship, metal-work, clothing and personal adornment, and stone flaking, mosaic, and feather-work.

The geographical area under survey in this book runs from the Mexican province of Jalisco to the north, to the upper half of the Republic of Honduras to the south; inside this region were built the extraordinary series of stone "cities" whose remains form one of the great wonders of the world to-day, the problem of their rise and ruin being complicated by the glimpses yielded by stone carved inscriptions and figures.

The beautiful photographs illustrating Mr. Joyce's pages show not only the better-known sites such as Palenque, Chichén-Itzá, and Mitla, but the newer site in British Honduras which has recently been under investigation by the British Museum. As regards scuplture, the author says that "the Maya relief sculptor was a master, surpassing in this respect the artists of Egypt and Mesopotamia . . . his delineation of figures in profile was well-nigh perfect"; yet the art was never emotional, being nearly always "characterized by a calm and almost superhuman serenity." The illustrations to the chapter devoted to the sculptor's art bear out Mr. Joyce's claims for New World ability, and form an array of astonishing interest; there is, in this Maya-Aztec culture, a quality invariably arresting, nearly always surprising: for it stands alone, bearing no deep resemblance to the art of any other part of the globe, but stamped with the power of a genuinely original development. Much of the delicate work, the writings and the paintings, of the Maya people have been irretrievably lost, but it is satisfactory to know that to-day every

effort is being made to preserve what remains of stonework, frescoes, pottery, etc., and that Lubaantun, the one great Maya site upon British soil, is being studied and opened by experts.

This carefully prepared volume upon a fascinating subject will prove of great help to students and lovers of art; and the publishers are to be congratulated upon the production of a remarkable contribution to the series.

L. E. E.

AUSTRALASIA AND PACIFIC ISLANDS

The Southern New Hebrides: an Ethnological Record.— C. B. Humphreys. Cambridge: University Press. 1926. 9 × 6, pp. xvi. + 214. 12*s.* 6*d. net.*

This is a careful and important account, founded partly on personal experience and partly on the results obtained by previous observers, of the southern islands of the New Hebrides—Tanna, Anaiteum, Futuna, Aniwa, and Eromanga. The book is chiefly valuable to anthropologists, but it is not without some interest to geographers, in that it throws light not easily found elsewhere on just that part of the New Hebridean group which, though nearest to the French administrative headquarters in New Caledonia, is yet least under French influence. If ever again the actual partition of the group between the British and French claimants comes up for consideration, the political geographers will find themselves confronted with a case only to be decided by a new "judgment of Solomon."

The book is provided with an excellent index, but the general reader, and especially the geographers, will regret the absence of a map to show the relative position of the islands lying to the south and to the north of the central island of Efata, where the administrative centre of the Anglo-French New Hebrides Condominium is established.

E. im T.

HUMAN AND HISTORICAL GEOGRAPHY

Studies in English Commerce and Exploration in the reign of Elizabeth.— A. L. Rowland and **E. R. Manhart.** University of Pennsylvania Press: 1924. 7½ × 5, pp. xviii. + 190, 179. *Sketch-maps.*

Under this comprehensive title two students of Prof. E. P. Cheyney's have printed their theses presented for the doctoral degree. Though the two studies are bound together in a single volume, they are separately paged and indexed, and are quite independent. The first study, "England and Turkey, the Rise of Diplomatic and Commercial Relations," by A. L. Rowland, treats of the history of the Turkey Company to 1603, with some preliminary survey of early English trade with the Levant. The second, "The English Search for a North-West Passage in the time of Queen Elizabeth," by E. R. Manhart, deals mainly with the voyages of Frobisher, Davis, and Waymouth. Both studies are good examples of the admirable work that is being done in the University of Pennsylvania under the prompting of an inspiring and able teacher, but since the materials on which they are based have apparently been confined to the more accessible printed sources, it would be unreasonable to expect from them much originality of treatment or result. Dr. Rowland's summary of the early story of English relations with Turkey is clear and well written, and may well be consulted as an introduction to the subject. It is to be hoped that he will proceed to a further investigation of the history of the Capitulations, to which he makes brief reference, for there is no doubt that in it there is to be found one of the most important roots of the extra-territorial jurisdiction that has presented so many difficult problems in recent years. Dr. Manhart's study is of less importance, for it adds little or nothing to the well-known story of the voyages to the north-west that is contained in the

Introductions to the volumes of the Hakluyt Society, from which he quotes so frequently. A considerable amount of fresh material in relation to Frobisher has been lately made accessible from unprinted sources, but with this he is apparently unfamiliar. A. P. N.

A Selection of the Principal Voyages, Traffiques and Discoveries of the English Nation.— Richard Hakluyt, 1552–1616. Set out with many embellishments and a preface by **Lawrence Irving.** London: William Heinemann, Ltd. 1926. $8\frac{3}{4} \times 6\frac{1}{2}$, pp. xxiv. + 294. *Illustrations.* 10*s.* 6*d. net.*

As an introduction to Hakluyt's great work, this attractively produced book should be very successful. Once having read it, few are likely to stop short with Mr. Irving's selection. The narratives, reprinted without alterations, include Hawkins' and Drake's voyages, Cavendish's less fortunate expeditions, and the defeat of the Armada, and these should suffice, in the editor's words, to "swamp the powder with rich jam," or to "rival the most lurid fiction." The preface, written in a hearty swashbucklering style, is a downright defence of the Elizabethan adventurers, and both a challenge and a consolation to modern Englishmen. The reader, however, might well have been left to draw his own conclusions from the texts. The numerous decorative cuts are in the same spirited manner; a few, perhaps, rather overloaded with detail. Some recur twice and even three times. A sketch-map in contemporary style would have completed the volume suitably.

The World Encompassed, and analogous contemporary documents concerning Sir Francis Drake's Circumnavigation of the World, with an appreciation of the achievement by **Sir Richard Carnac Temple, Bt.** [Edited by **N. M. Penzer.**] London: The Argonaut Press. 1926. $10\frac{1}{2} \times 8$, pp. lxvi. and 236. *Maps. Price* 24*s.*

The aim of the Argonaut Press, of which the handsome volume before us is the first production, is to publish accounts of early voyages and travels, particularly of such as are difficult to obtain otherwise. The general editor, Mr. N. M. Penzer, deserves congratulation both on the extremely attractive appearance of the book, and also on the wise choice he has made for his opening volume. Of all the great English seamen of the sixteenth century no name has a more general appeal than that of Francis Drake, and of Drake's many exploits the most remarkable and the most important in its results was certainly the great voyage round the world begun in 1577 and finished in 1580.

It is precisely one of the early accounts of this memorable voyage that Mr. Penzer has selected for republication: the little book entitled 'The World Encompassed by Sir Francis Drake,' which appeared in London in 1628, and is one of the most important sources of our knowledge of the events of the voyage. The account is based chiefly on the notes of Francis Fletcher, who accompanied Drake as chaplain, but the actual editor was Drake's nephew, another Francis Drake. The original edition of 1628 is now extremely rare, and the work has only been reprinted once in modern times, by the Hakluyt Society in 1854. During the last seventy years, however, much new material has come to light, and there seems ample justification for this fine new edition, in which much of that material is embodied. The book is divided into three main sections. There is first an interesting introductory essay by Sir Richard Temple, entitled "An Appreciation of Drake's Achievement," in which we are taken right through his career from start

to finish, special attention being naturally given to the voyage round the world. This essay is followed by the actual text of the "World Encompassed," printed without notes. The third section is composed of a number of selected contemporary documents connected with Drake's voyage. These include the above-mentioned narrative of Francis Fletcher, the relation of the pilot Nuño da Silva, and Edward Cliff's account of his voyage under Winter in the *Elizabeth*. The first of these is for the first time printed in full from the MS. in the British Museum (portions only having been given in the Hakluyt Society edition and these not always quite correctly), so that here we have a contribution of real value to students of the voyage. Several maps are added to illustrate the course of Drake's wanderings, and a facsimile is given of the rare map by Nicola van Sijpe, which is probably the earliest map known showing Drake's route. It would be difficult to overpraise the general appearance of the volume: print, paper, binding, and format are all alike admirable. The Argonaut Press is to be congratulated on its auspicious start.

F. P. S.

THE MONTHLY RECORD

EUROPE

Distribution of the Welsh Language in Wales.

MR. TREVOR LEWIS, of University College, Aberystwyth, discusses the distribution of Welsh in the Principality according to the census of 1921, in *Annales de Géographie* for 15 September 1926. The persistence of Welsh has been remarkable in view not only of the English conquest but of the constant economic pressure which has forced bi-lingualism on so many young Welsh people of both sexes seeking employment in England or abroad. The strongholds of the language are in remote thinly peopled districts isolated either by the mountains or the sea, whereas the coastal plains have become effectively Anglicized. The five most Welsh counties are Anglesey, Carnarvon, Merioneth, Cardigan, and Carmarthen, in most of which the percentage of Welsh-speaking people is at least 30 to 50, and in smaller areas considerably higher, being as high as 80 to 100 in the Lleyn peninsula of Carnarvon. The southern valleys of the Snowdon massif, the heart of the territories faithful to the former princes, also show a particularly high percentage. The most Welsh area in the southern part of the country is about the long mountain ridge, Mynydd Bach, which trends south-west from Plinlimmon, particularly where Cardigan, Carmarthen, and Pembroke meet. Here the percentage is from 80 to 100. This latter mountain region was a place of refuge for numbers of Welsh Non-conformists during past persecutions, and in general all the highly Welsh areas are strongholds of Welsh Calvinistic Methodism. At the other extreme we have the northern, western, and southern coastal strips where very little Welsh is spoken, always excepting those of Carnarvonshire and Cardiganshire. English influences have spread very rapidly along the north coast, with its numerous seaside resorts and express route to Ireland. In the south of Pembrokeshire, as a result of the influx of English, Norman, and Flemish settlers, no Welsh is spoken at all, and this is nearly true also of the lowland agricultural parts of Glamorganshire. The English border with the valleys of the Severn and Wye speaks comparatively little Welsh, but here we find the curious phenomenon, both in the slate-quarrying districts of the north and the colliery districts in the south, of the Welsh syntax being adapted to the English vocabulary.

Radnorshire is an exception to the usual Welsh-speaking character of the pastoral mountain tracts, an anomaly attributed to military implantations in Cromwell's time. Notwithstanding the national revival of the nineteenth century, Welsh is slowly losing ground everywhere, its resistance to English penetration being weakened by the disruptive tendency noticeable in the various county dialects. The same words are not everywhere used by the country people in the same sense, even though the Bible and religious books preserve some semblance of official Welsh. It is argued that although the Welsh have lacked a central capital for the full expression of their nationalism, the existence of such a centre would have led to a more rapid disappearance of the language on the analogy of the near extinction of Gaelic in Scotland.

Cartography in Estonia.

A brief account of the progress of cartography in Estonia is given by Dr. Haltenberger in a recent publication of the Geographical Institute of the University of Tartu (No. 5, 1925). The basis of the work is the pre-war Russian 1, 2, and 3 verst maps, founded upon the ½-verst map. Estonia is covered by 421 sheets of the 1-verst map. During the German occupation, survey sheets on the scale of 1/25,000, based upon the 1-verst map, but with some revision and German inscriptions, were prepared. These included the coastal regions, the islands, and the environs of Tartu only. Another map of the whole of Estonia on the scale of 1/100,000 was also issued. Under the present *régime*, the cartography has been taken over by the General Staff. The south-eastern portion of the country, the Petseri region, had not been covered by the Russian 1-verst map. Since 1921, nine sheets on this scale have been published, special attention having been paid to the contours, drawn at intervals of 2 fathoms (about 12¼ feet). The publication concludes with a list of thirty-three titles of maps published in Estonia since 1918 by the General Staff and private firms. These include geological, climatic, and other maps of Estonia, and general maps of Eastern Europe and the world. The General Staff have also printed new issues of the 1 and 3 verst topographical maps, and twenty charts on various scales, as well as ½-verst maps of the Estonia–Russia boundary (twenty-four sheets) and the Estonia–Lithuania boundary (seventy-two sheets), though the ½-verst and 1-verst maps are not purchasable.

AMERICA

Fisheries of the Great Lakes.

The present position of the fishing industry of the Great Lakes is discussed by Dr. W. Koelz in the Bureau of Fisheries Document No. 1001 (Washington, 1926), recommendations being put forward for its improvement. The history and methods of the fishing and the species of fish are described for each lake separately. Through the number of jurisdictions, international and national, it is difficult to obtain precise information and data, but the production of fish in the lakes has undoubtedly declined greatly since the end of the last century. Some species, particularly the sturgeon, have been practically eliminated from all, and others from individual lakes; for example, the white fish in Lake Superior. In other cases the decline in the production of certain species has been checked: since 1890 the annual catch of white fish in Lake Michigan has increased, but it is still far below its former figure; trout have also increased there, and the catch is greater than those of the other lakes combined. Despite these facts, the total production of Lake Michigan for 1922 was the smallest on record. In Lake Erie, on the other hand, where the conditions for fishing are particularly favourable, the Canadian catch has increased rapidly, the peak year being 1918. Here, however, the increase in catch has not been at all

proportionate to the greater quantity of apparatus used. For Lake Ontario the record catch in American waters was for the year 1880. At the present time the chief species taken appear to be herring and trout. On the whole, the industry seems to be more prosperous in Canadian waters. A census for all the American waters taken in 1917 showed that though the market value of fish had increased 100 per cent., and much more apparatus was employed, the output hardly equalled that of 1908, and was below that of 1890 and 1899. White fish, which was the chief catch in 1880, was fourth in 1922, being rivalled by the sucker, which was previously regarded as worthless. Dr. Koelz, who insists that commercial fishing does not necessarily lead to depletion, attributes the decline to pollution of the water by, amongst other causes, the dumping of ashes from steamers, wasteful methods of fishing, the adoption ot unproved systems of propagation, and the diversity of fishery laws. He recommends the constitution of an international authority to promote research and to co-ordinate legislation, the restoration of a closed season to protect spawning fish, and investigations into the life-histories of the important species.

Longitude of La Paz, Bolivia.

A recent publication of the Observatory of the College of San Calixto, La Paz, contains a detailed account of the determination of the longitude of the observatory by Father P. M. Descotes, S.J., and Major A. Prieto. In 1837 and 1852, Pentland, by the transport of chronometers, had arrived at the values of 68° 51′ 45″ W. and 68° 9′ 10″·6 W. respectively. The observations upon which the present value is based were carried out in 1922 by the exchange of telegraphic signals with the observatory at Santiago de Chile. The results gave the longitude of La Paz as 68° 8′ 12″·90 W. ±0″·1.

POLAR REGIONS

The Greenland Expedition of the University of Michigan.

Prof. W. H. Hobbs contributes a preliminary account of this Expedition to the *Geographical Review* for January 1927. The party of six, under Prof. Hobbs' direction, included Prof. L. M. Gould, a geologist, and Mr. S. P. Fergusson of the U.S. Weather Bureau, as well as a topographer and a wireless operator. The area selected for work was that lying east of Holstensborg, West Greenland, where the strip between the coast and the inland ice is wider than usual. The objects of the expedition were to study the past glaciation, the inland ice, and the meteorological conditions. The district is largely unknown; but Otto Nordenskjöld had made a journey to the edge of the ice-cap in 1909. The party reached Holstensborg on July 6 and left on September 7. Meteorological observations were made at the base camp at the head of Maligiak fiord throughout, while four members of the party, accompanied by Greenlanders, reached the ice-cap by a journey of 75 miles, but were only able to remain there for four days through a shortage of supplies due to the failure of the natives to secure game. Prof. Hobbs concluded that at one time the whole of the district had been covered with ice. A characteristic is the contrast between the higher surfaces of the coastal belt, with convexly rounded contours and ribbed structure, and the lower interior belt, where degradation has proceeded much farther. Here striated boulders, absent from the coast, are common, and the rock surface is well polished and covered with grey glacial clays. The other factor in the checker-board pattern of the topography is the network of fracture lines. He concludes that there was an early advance of ice to the present coast-line, the retreat of which was followed by the formation of cirques on the higher ridges; The ice then readvanced as far as the western arm of Lake Taserssuak,

eroding the interior belt. In the immediate neighbourhood of the ice-cap, the trenched topography becomes more nearly subdued to one plane, with numbers of knot-like hills rising from it, and it is thought that this is similar to the surface now actually overlain by the ice-cap. The existence of twice-eroded cirques is adduced as evidence of this double glaciation. Near Holstensborg, the lower levels of the cirques are at or near sea-level, while farther south they are found at an average elevation of 2000 feet, which points to a post-glacial subsidence to approximately that extent, though raised terraces prove that there have since been repeated uplifts. The features of the meteorological records were the small precipitation (approximately 16 mm. in nine weeks), high average cloudiness, low atmospheric pressure, and slow movement of the wind at all heights. The existence of this warm dry region on the border of the ice is attributed to the ice tongue of the southern Stromfiord forming a barrier to the low-pressure systems from Baffin Bay. *Ballons sondes* were sent up from the base camp, and pilot balloons from the ice-cap. The topographer, Mr. Belknap, triangulated an area of approximately 1000 square miles, prepared some plane-table surveys, and started a line of levels from tide water towards the inland ice. Before leaving, preparations were made for the resumption of the work this year.

The Eskimo Colony at Scoresby Sound, East Greenland.

In April last year (vol. **67**, p. 381) we referred to the voyage of Capt. Mikkelsen in 1924 to Scoresby Sound to prepare for the settlement there of a party of Eskimo colonists, and mentioned the fact that this party had been taken thither in the summer of 1925. Captain Mikkelsen has since given a lecture at the Paris Geographical Society on the work of both seasons, and it is printed in *La Géographie*, September–October 1926, so that the narrative is now available in a language more generally understood than the Danish. The idea of forming a settlement on the east coast had a certain political motive behind it, the treaty with Norway having thrown open this coast to the private enterprise of strangers, so that it was important to establish effective occupation on the part of Denmark. Captain Mikkelsen had much to say of the relative richness of the Scoresby Sound region. The abundance of grass justifies the name Greenland, while brushwood covers large areas and many flowers are seen. Animal-life includes walruses, seals, polar bears, musk oxen, etc., some in vast numbers and extraordinarily tame. At Cape Stewart insects were in swarms, including both butterflies and bees, the sound of the latter filling the air. The neighbourhood is strewn with fossil remains of plants and animals of a time when the climate permitted the palm tree to flourish. The voyage home was perilous owing to the loss of the rudder through ice-pressure, but by good fortune was accomplished in safety. Seven men were left to continue the preparations for housing the settlers, and were cut off from the outside world until the visit of Dr. Charcot in the *Pourquoi pas ?* on 1 August 1925. One of the seven, the geologist Petersen, had died, but the rest were well. During an enforced stay at Cape Stewart owing to bad weather they were kept amused by the tameness of the foxes, which are there in great numbers and entered the houses without fear. An interesting discovery was that of hot springs at Cape Tobin, which maintained a temperature of 62° C. throughout the winter. Early in September Captain Mikkelsen returned with ninety Eskimo colonists of all ages, brought from Angmagsalik, who greeted their new home with enthusiasm and at once set about their ordinary avocations. The result of the experiment will be awaited with interest.

MATHEMATICAL AND PHYSICAL GEOGRAPHY

Dutch Pendulum Observations in the Great Oceans.

Considerable interest has been aroused in the voyage of the Dutch Submarine K XIII., which left Helder on 27 May 1926, with Dr. Vener Meinesz on board, for the purpose of making determinations of gravity at sea by means of a new apparatus. The preliminary results of the voyage, down to the arrival at Honolulu, have been communicated to *Nature* (29 December 1926) by Dr. J. J. A. Muller. Owing to rough weather it was unfortunately impossible to take observations above the slope to the deep sea, but from June 2 onwards the pendulum apparatus was used nearly every day while at sea from the submerged vessel, and it fully answered to expectations. The deep-sea soundings were not so successful, the senders of the under-water clock signals having been placed too high in the ship, in the wave zone, so that the echo was not a definite sound. Owing to a defect in the construction, which could not be remedied on board, the sonic depth-finder proved of no use, so that the additions to our knowledge of the depths of the oceans along the route are less than had been hoped. Still some results of interest were obtained. In the Atlantic, between 32° and 54° W., rapid changes of depth were noted, and the sea-bed appears to be very rugged: the depths showed great differences from those indicated on the Prince of Monaco's charts. Dr. Muller gives the preliminary results of computations of anomalies of gravity on the several sections of the route, which led by Curaçao and the Panama Canal to the Pacific, then by Mazatlan to San Francisco, Honolulu, and Guam. A cablegram reported the arrival at Amboina on November 25. Both in the Atlantic and Pacific the excesses of gravity extend over enormous areas, while the excesses or defects on the continents possess a more limited, regional, character. The preliminary results show no trace of ellipticity of the Equator, but for a solution of this problem the final results must be awaited. Dr. Meinesz was to stay in Java for some time to recover from the fatigues of the voyage before returning home in a mail steamer. He had met with great help from the commander, officers, and crew in carrying out this task, and at all the ports touched at he received a cordial reception, especially from scientists at San Francisco and Honolulu. As a token of appreciation the United States Coast and Geodetic Survey undertook to compute the isostatic reductions of the observations, and they have already been received for those between Holland and Curaçao. The excess of gravity in the Atlantic has thereby been confirmed.

GENERAL

A Pair of Globes of 1522.

In speaking a few years ago of the various old globes preserved at Vienna, Dr. Eugen Oberhummer mentioned a pair in the Hauslab-Liechtenstein collection, on the history of which, by careful examination, he had been able to throw some new light. He has since dealt more fully with these globes, in conjunction with Herr A. Feuerstein, in a communication printed in the *Denkschriften* of the Vienna Academy of Sciences (67 Band, 3 Abhandl., 1926), and accompanied by photographic illustrations. The terrestrial globe had previously attracted attention as giving one of the quite early representations of America, and had been described by Varnhagen in 1872, and subsequently discussed by Wieser, Luksch, and others. Its general resemblance to Schöner's globes of 1515 and 1520 had led some of these writers to attribute it to that German map-maker, while it was even suggested that it was earlier than 1515 (the American portion showing a clear relationship with Waldseemüller's map in the Strasbourg Ptolemy of 1513), and that it might have been copied

by Schöner. The celestial globe, which strangely enough had previously been entirely ignored, though the two are evidently a pair, has supplied the clue to the making of the globes, as it bears an inscription (now with difficulty legible) stating that it had been made to the order of Nicolaus Leopold, "Canonicus Brixinensis," as a gift to Sebastian Sprenzer (chosen Bishop of Brixen in 1521) in the year 1522. It seems probable that Von Hauslab acquired the globes at Brixen while engaged in mapping the Tirol in 1816–17, and their association with the place had suggested itself to earlier students through the prominence given to it on the terrestrial globe. The latter is undated, but it is probably slightly later than its fellow. There is an evident allusion to Magellan's voyage in the picture of a Spanish caravel off the coast of Chile; and the results of this voyage did not become generally known till 1523. Another indication of a date at least after 1520 is the reference to the "Guiacum lignum" as a product of the island of Haiti, a statement almost certainly taken from Apianus' map of 1520, which in turn had taken it from the work of Ulrich von Hutten printed at Maintz in 1519. In the main, however, the terrestrial globe is a close copy (so far as the size permitted) of Waldseemüller's big map of 1507, the wording of many legends being almost, or quite, identical. But that Apianus' map too was known to the maker is proved not only by the reference to the Guiacum, but by another statement found in the globe, which is made by Apianus but not by Waldseemüller. The relationship between the Brixen globe and Schöner's can now be fully explained by the use of a common source, namely Waldseemüller's big map, which is more closely followed by the former than by any of the other maps of the time. The illustrations accompanying the paper give general views of the two globes with reproductions of certain parts of the world-picture and of the signature of the celestial globe.

The Cork Industry.

The present position of the cork industry is briefly touched upon by Dr. W. O. Blanchard in the *Journal of Geography* for October 1926. The cork oak forest areas are mainly confined to Iberia and Northern Africa. Algeria, Portugal, Spain, and Morocco have the greatest acreage; but the order of production of cork is otherwise. Portugal and Spain are shown as producing 35 per cent. each of the world's total, but Portugal's share is probably the greater, as it exports considerable quantities to Spain. Algeria is credited with 20 per cent. of the total. War demands greatly stimulated the industry, but since then the decline of the Russian and German markets, the introduction of prohibition in the United States, and the invention of substitutes for bottle-corks have hit the industry in Catalonia. Other markets have been closed by protective measures. As Great Britain, France, Germany, and the United States take about 85 per cent. of the world's output, an alteration in their demands is serious for the industry. Cold-storage insulation and packing for fresh fruit, however, utilize a considerable proportion.

OBITUARY

Sir John Scott Keltie.

JOHN SCOTT KELTIE was born at Dundee on 29 March 1840 and died in London on 12 January 1927, within three months of completing his eighty-seventh year, preserving almost to the last day the remarkable vigour of body and mind which characterized his whole life.

He was educated in Perth, then successively at the Universities of St.

Andrews and Edinburgh, and at the Theological Hall of the United Presbyterian Church in Edinburgh, where he completed the course but did not enter on a clerical career. While a student he had begun systematic literary work with Messrs. W. & R. Chambers, and after ten years in Edinburgh, where he married, he in 1871 came to London to join the editorial staff of Messrs. Macmillan & Co. There he became sub-editor of *Nature* in 1873, and editor of the *Statesman's Year Book* in 1880. Geographical subjects had early attracted his attention, and in 1873 he began to contribute geographical articles and reviews to *The Times*, and gradually acquired a position of authority on matters of travel and exploration.

Keltie, who had joined the Royal Geographical Society in 1883, was in 1884 appointed the Society's Inspector of Geographical Education, the selection being made from a number of candidates. After a strenuous year spent in examining the whole question of geographical education in the British Isles and on the continent of Europe, he produced the memorable Report which occupies more than 150 pages of vol. I of the *Supplementary Papers* of the R.G.S. This Report is an important landmark in the history of geographical studies in this country, and may well be viewed as the starting-point of the rapid progress which has brought Geography to the front as an indispensable branch of University studies. Before the completion of the Report the Librarianship of the Society fell vacant by the tragic death from small-pox of Mr. E. C. Rye in February 1885, and Keltie was appointed to the post in the following month, when Lord Aberdare was President and Mr. Markham (afterwards Sir Clements Markham) and Mr. Douglas Freshfield Honorary Secretaries. An exhibition of books, maps, and educational apparatus collected by the Inspector of Education was arranged in the Map Room of the Society in Savile Row, and afterwards shown in different parts of the country; it was ultimately presented to the Teachers' Guild.

The duties of Librarian at that time were light and only occupied a small part of the day, leaving ample leisure for the pursuit of literary or journalistic work, of which Keltie took full advantage. By degrees he was drawn into closer and closer cooperation with the Assistant-Secretary, Mr. H. W. Bates, F.R.S., until he became his right-hand man in all that concerned the working of the Society, so that on Bates's death in the influenza epidemic of February 1892 Keltie was accepted at once as his natural successor. Thenceforward the routine of the Society filled an increasing share of Keltie's time, and he modified his literary work so as to make it ancillary to what had now become the great purpose of his life, the promotion of the interests of the Royal Geographical Society.

The first important task that fell to him was the reorganization of the Society's serial publications. The New Series of monthly *Proceedings* which took the place of the old irregularly published *Proceedings* in 1879, had under Mr. Bates's editorship gradually come to assume many of the features of a magazine, collecting information from other sources than those which reached it by the channel of the Society's meetings. It was felt by the more progressive members of Council that the revival in interest in geography which was reflected in the rapid growth of our membership demanded the presentation of geographical intelligence in a form more popular than that which had hitherto been considered consistent with the dignity of a learned Society. The battle raged mainly with regard to the conspicuous retention as the chief title on the cover of the word "Proceedings." On this point a temporary compromise was effected, but it was not till fourteen years later that the title was simplified by the adoption of the more generally attractive and less

cumbrous form now in use. The first number of the *Geographical Journal* appeared in January 1893, and its success under Keltie's judicious and skilful direction was both immediate and permanent. A similar problem was presented by the evening meetings, at which the more conservative authorities were at first opposed to the use of lantern slides until the almost surreptitious introduction of a singularly beautiful set overcame all prejudices. In this, as in the fiercely contested matter of the admission of ladies as Fellows of the Society, Keltie was on the side of progress, though he preserved a semblance of official impartiality with no little effort. As a mark of the appreciation of his services in this time of transition the title of Assistant-Secretary was replaced by that of Secretary in 1896, thus restoring the practice which prevailed before 1849.

In 1895 the Society was responsible for the Sixth International Geographical Congress, the planning and management of which taxed Keltie's powers to the uttermost, but the resulting success justified the efforts which he made to secure it.

The conduct of the routine of a rapidly growing institution of such large and varied interest as the Royal Geographical Society would have been work enough if it had been possible to continue to expand in its existing premises, but for many years the Secretary's time was invaded by the additional labour of first searching for and then getting settled into new premises. This was achieved in 1912, when the Society moved from 1, Savile Row to Lowther Lodge. Although Keltie was now seventy-two years of age his vigour was unimpaired, and few could have guessed from his appearance that he had passed his sixtieth year. He recognized clearly enough that he could not hope to carry on his heavy work indefinitely, and he welcomed the appointment of Mr. A. R. Hinks, F.R.S., as Assistant-Secretary, realizing the importance of initiating his successor before he himself had to retire. In 1915 he handed over the Secretaryship to Mr. Hinks, continuing to act as joint Editor of the *Geographical Journal* until 1917, when, still in the glow of popularity with Council, Staff, and all the Fellowship of the Society, he felt it expedient to retire. His Reminiscences, communicated to an evening meeting of the Society on 5 February 1917, were published in the *Journal*, and give a panoramic view of the activities of the Society for the thirty-five eventful years during which he had been at the heart of affairs. He was destined to share in the government of the Society for ten years more as a Member of Council and later as Vice-President, and during this period, despite his years, he never missed a meeting of Council or committee which it was possible for him to attend.

While he himself would undoubtedly agree that his labours for the Society were his chief contribution to Geography—and it was no small one—he did much to promote sound views on doubtful problems, especially those of colonial expansion, by the frequent unsigned contributions to the Press in which he helped to mould public opinion. He was the initiator in collaboration with others of several important series of geographical works of high value, such as the World's Explorers Series published by Messrs. George Philip & Sons, and the Story of Exploration Series published by Mr. Alston Rivers. His more direct contributions to geographical literature include 'The Partition of Africa,' an account of discovery and colonization in the years which followed the journeys of Livingstone and Stanley, and 'Applied Geography,' a small textbook expounding great principles. At the time of his death he was completing a series of school readers in collaboration with Mr. S. C. Gilmour.

Keltie was an unfailing attendant for forty years at the annual meetings of

the British Association; for a long time he was Secretary of Section E (Geography); at the Toronto meeting of 1897 he was president of the Section; and later a member of the Council of the Association.

Following on the International Congress of 1895, Keltie was elected an Honorary Member of the Vienna Geographical Society and Honorary Corresponding Member of practically every Geographical Society in Europe and of several in America. Later he received the Cullum Medal of the American Geographical Society of New York, the gold medals of the Paris Geographical Society and of the Royal Scottish Geographical Society, and in 1917 the Victoria Medal of the Royal Geographical Society. His *Alma Mater* at St. Andrews conferred on him the honorary degree of LL.D., and he was decorated with the orders of the North Star of Sweden, St. Olaf of Norway, and White Rose of Finland. In 1918 he received the honour of knighthood.

The leading characteristics of Sir John Keltie on which his success depended were quick intuition, great caution, and kindly tact. His intuition served him well by enabling him to get at the heart of a subject in an incredibly short time, and his caution helped him to avoid the pitfalls which usually lie in wait for an abnormally active brain. Whether in reviewing books or appraising the potentialities of a would-be explorer, the balance of these two qualities gave great value to his judgments. Latterly caution naturally tended to preponderate, and "When in doubt do nothing" became a favourite quotation; but he was very rarely in doubt. His tact in overcoming difficulties of prejudice and temperament was unfailing, and in the days of keen international rivalry in exploration this did much to preserve a harmonious atmosphere in the Society. Keltie's nature was both kindly and generous, and his official relations with explorers rarely failed to ripen into friendship as lasting as life. When the Society's headquarters were still at 1, Savile Row, a day seldom passed without a geographical lunch party in one of the adjacent restaurants or in his Club, with Keltie as the bond of union—not infrequently between notorious rivals. His Sunday evening parties, when his genial duties as host were shared by his daughter and son-in-law, live in the minds of many survivors now scattered over distant lands, and were cherished memories with more who went before him. Not least will he be missed in the scientific and literary dining clubs which he loved to frequent, and especially in the Geographical Club, the centenary of which he had hoped to celebrate this year, the "Sette of Odde Volumes," and the "Confrères," of which he was the last surviving original member. In social intercourse he had in a high degree the gift of promoting conversation, though he himself spoke little, and rarely allowed his own views on controversial matters to appear. Few except his most intimate friends could have known his opinion on political, literary, or religious matters, for his tolerance was unbounded. He was too busy a man up to the very end to have time for sport or any form of relaxation except an occasional round of golf, and the meeting with friends at the dinners of Clubs and Societies, a pleasure that he was able to enjoy to within a few weeks of his death.

To those with whom he worked Keltie always showed himself as a considerate colleague rather than as a chief, and he had the rare knack of guiding by imperceptible influence. He was faithful to the friends of his youth, and was particularly thoughtful in showing kindness to those whose lives had been less fortunate than his own. I met him first in 1885; since then our friendship has grown ever closer, and I write under constraint, lest warm affection should lead me beyond the limits appropriate to an appreciation of the life-work of a geographer.

HUGH ROBERT MILL.

An adequate reason has been brought to my notice why I should respond to the request that has been made to me to add something to Dr. Mill's tribute to the cherished memory of our old friend and excellent colleague, Sir John Scott Keltie. I am, it appears, the only living member of the Council that in 1885 added Keltie to the permanent Staff of the Society. At that date I had already served for four years as the Junior Honorary Secretary. One of the more prominent subjects of our discussion at that period was what steps, if any, should be taken by the Society to support and stimulate Geographical Education in this country. Mr. Francis Galton's scheme—one of offering school prizes—had broken down; a single school (Dulwich College), happy in a zealous instructor, having year after year swept the field. The Council was for the moment divided: to one section it appeared that Education was beyond the scope of the Society, and that it should limit its efforts to the promotion of Exploration and Research, while Mr. Galton—habitually in Committee more critical than constructive—was ever at hand ready to point out ingenious objections to schemes that were substitutes for his own, which had admittedly failed. It was a counsel of prudence on the part of the Educationalists, who included the Hon. Secretaries, to postpone discussion until they had had time to strengthen their case by obtaining evidence of what was being done on the Continent and particularly in Germany. Some one had the happy thought of commissioning Keltie, already known to us as a very competent geographer, to go the round of Europe and to investigate and report on the state of Geographical Education in the various countries.

Dr. Mill has pointed out, and I need not repeat, how well Keltie carried out his mission. His report was the chief weapon in the Hon. Secretaries' hands, and it proved an effectual weapon. Opposition melted before it. After due discussion I was authorized by the Council to appear before the Vice-Chancellor of Oxford, then Dr. Jowett, and in the name of the Geographical Society invite the University to accept our aid in providing funds for a School of Geography. A similar offer was made to and accepted by Cambridge.

It is therefore to Keltie in the first place that we owe that Geography now holds in this country a place in Education at least equal to that which it does on the Continent. The policy of beginning at the top, with the old Universities, has fully justified itself, and the Schools of Oxford and Cambridge have sent out teachers, both men and women, who have raised the standard of teaching throughout the country and provided us with textbooks that are no longer open to reproach.

On another matter I was at the time intimately connected with I am glad of an opportunity to confirm and emphasize what Dr. Mill writes. I refer to the development of the *Geographical Journal*. Markham as an Hon. Secretary had for years struggled in vain to persuade the Council to issue a monthly periodical in place of occasional and unattractive *Proceedings*. When leave was, in 1879, at last granted it was given with many hesitations and restrictions; it was not till fourteen years later that these were one by one removed or forgotten, and a happy result was mainly due to the quiet tact and literary judgment of Keltie, to whom it was reserved in 1893 to give the cover a simpler and more suitable form.

In Council Keltie—in this resembling Bates, his predecessor in the Secretaryship—seldom spoke. He was in public equipped with a persuasive and impressive reticence, but in the informal conferences held between the President and officers of the Society that commonly preceded Council Meetings we always listened respectfully to, and often profited by, his sage and well-considered suggestions. Keltie's natural kindliness was an invaluable quality in carrying

out the daily work of the Secretary, which consists largely of interviewing many various conditions of men, in attaching to the Society the right sort of traveller, and in eliciting from each visitor what of importance he may have to tell. Few callers, I fancy, left Keltie's room discontented. His tact and courtesy were irresistible. Even the globe-trotter who came to him with a few unimportant notes or photographs was apt to leave under the impression he had communicated to the Society invaluable information.

Keltie's retirement from office was regretted by all the Council, most of all perhaps by those of us who as Honorary Secretaries had shared for a period his labours. The act was, I think, not least of all a trial to himself. To resign at the call of age the work of a lifetime is no doubt the part of a wise man. But the better the work has been performed the greater must be the wrench: and Keltie was always younger than his years. We all rejoiced, therefore, that it was possible to soften the severance of old ties by keeping him among us, first as a Member of Council and finally as a Vice-President. It was a further pleasure to his many friends among our Fellows that Keltie's services to Science and the Nation, carried out mainly as an officer of the Society, should have been recognized by the State. No man ever less sought for honours than Keltie, yet honours came to him from all quarters, and gave him the satisfaction of feeling that his lifelong exertions had been fully recognized in almost every country in Europe. In the future the Society may possibly have secretaries who will be more prominent as travellers or scientists, but it will never have a better geographer or an official more devoted to its service and its highest interests.

DOUGLAS FRESHFIELD.

At the Evening Meeting of January 24 the President invited the Fellows present to associate themselves with the terms of the following Resolution, which the Council had adopted that afternoon:

> RESOLVED that this Council place on record their high appreciation of the devoted services to geography which Sir John Scott Keltie rendered during his thirty years' tenure of office in the Society as Inspector of Education, Librarian, and Secretary and Editor of the *Geographical Journal*, as well as since his retirement from office as a Member of the Council and Vice-President of the Society: and they ask the President to convey to his daughter, Mrs. Lennox Gilmour, the assurance of the Council's sympathy with her in her loss and their sorrow at the death of a well-loved colleague.

We have the writer's permission to publish the following letter from Dr. Fridtjof Nansen:

"The sad news of the death of my very dear friend Sir John Scott Keltie has only now reached me. May I ask you to accept and to convey to the Council of the Royal Geographical Society the expression of my deepest sympathy in the great loss for your Society, for Geographical Science, for us all? You will know better than I could explain it what he has been during his long working day for the Royal Geographical Society and for Geographical Science, but I do know perhaps better than many of your members what he has been for geographical travellers. During the thirty-nine years I knew him I have experienced how he always encouraged and assisted in every possible way any geographical enterprise which he thought good and worthy of support, and with what unreserved appreciation and enthusiasm he greeted any deed of exploration which brought new light. And what a staunch friend he was

to the young explorers! I cannot say why, but ever since the first day we met in May 1888, when I was on my way through London to the crossing of Greenland, we have been friends for life. I cannot possibly say how much I owe to him. I always had his implicit confidence in my plans and undertakings, however much they may have been attacked by others, and his encouragement, advice, and untiring support were always a wonderful stimulus and help. And so I know it was with other travellers. His influence upon what has been done of geographical work during his years is difficult to measure, but it was important. He was a man in whom there was no deceit, a true son of Scotland, a noble man, and a true friend.

From the many other letters addressed to the Society we may extract this excellent phrase of Dr. Isaiah Bowman: "He was to a high degree an Institution in himself." To all those who have written the President and Council have expressed their cordial appreciation.

CORRESPONDENCE

The Mishmi Country

I WAS much interested in Mr. D'Arcy Weatherbe's brief account of his and Mr. Stevenson's journey from Burma to Assam *viâ* the Krongjong Pass, which I have just read in the *Geographical Journal* for July. May I, however, correct a wrong impression which the reader can hardly avoid?

Mr. Weatherbe says: ". . . but we had no trouble whatever with the Mishmis, and found them quite a manly and certainly a reasonably friendly and hospitable people, *previous and contrary reports notwithstanding*" (italics mine).

I think that if Mr. Weatherbe had travelled in the Lohit Valley, say in 1906 (or even considerably later than that) instead of in 1926, he himself would have made a "contrary report."

It is unnecessary to go into all the attempts to blaze a trail through the Mishmi Hills, either from Sadiya to Rima or in the reverse direction, until we come to the period 1911–1914, with Major F. M. Bailey's journey from Batang *viâ* Rima to Sadiya in the former year, and Mr. T. P. M. O'Callaghan's journey from Sadiya to Rima in the latter year.

Major Bailey, most resourceful of travellers, had great difficulty in getting through the Mishmi Hills below Rima in 1911.

Then followed the Political and Survey Missions of 1912–1914 up the Lohit Valley, and in 1914 the present Political Officer of the Sadiya Frontier Tract, and other officers, travelled up as far as Rima, being everywhere welcomed by the people.

It is due, first to the unremitting labours of a succession of Political Officers at Sadiya, particularly to the late Mr. Needham and to Mr. Dundas; secondly to the missions of 1912–1914, and to the administration of the present Political Officer, who has won the entire confidence of the frontier tribes, that the Digaru Mishmis are now a "reasonably friendly and hospitable people." A period of contact with frontier and other British officers has sufficed to bring to the surface, through a natural veneer of suspicion, the underlying human qualities which exist in most of these tribes, however much they may be masked by circumstances.

I think Mr. Weatherbe is incorrect in saying that "the old Mishmi path which was supposed to exist up this river had become entirely obliterated."

It suggests that the path is no longer used. The path is used regularly in the winter months by Mishmis who cross the Krongjong to fish in the headwaters of the Mali Kha (Nam Yiu); occasionally they wander as far south as Fort Hertz. The difficulties encountered by Mr. Weatherbe were due mainly to the season and to an unusually wet spring in Hkamti Long; for the path on the Burma side follows the river-bed practically from the head of the Hkamti plain to the pass itself, and in the latter half of April, with the snow melting at those comparatively low altitudes (the Krongjong being under 10,000 feet), the river-bed would of course be pretty full.

Mr. Weatherbe's statement that "the Zayul Chu has not so very much more water in it than the Ghalum" is astonishing to any one who has seen both.

The Zayul Chu (Krawnaon) flows almost due south from Rima to Minzong, where it turns abruptly at right angles, receiving the quite small Ghalum from the east; and though it is true that from the Tidding (not Tiding) to Sadiya is nearly 100 miles by road, the distance in an air line is under 50 miles.

Mr. Weatherbe's journey is of considerable interest to those who study the North-East Frontier of India; he is quite right in claiming to be the first European to cross the Krongjong, though his route was known to Wilcox a century ago, and is mentioned by Griffith, and has of course been accurately mapped by Indian surveyors. But it is desirable that the account should be minutely accurate, so I hope he will forgive these few comments.

F. KINGDON WARD.

Sadiya, Assam, 12 December 1926.

MEETINGS: ROYAL GEOGRAPHICAL SOCIETY: SESSION 1926–1927

Sixth Evening Meeting, 24 January 1927.—The President in the Chair.

ELECTIONS.—George Edward Bearns; Herbert Edwin Bradley; John Dorr Bradley; Mrs. Mary Hastings Bradley; V. Edward Charawanamuttu, PH.B., A.C.P., F.C.I., M.A.A.S.; Major William Henry Saxon Davies, O.B.E.; Lieut. Edward Walter Fletcher, R.A.; Mrs. Elizabeth Fuller Goodspeed; Archibald Ernest Alfred Gostling; John Leggat; Miss Sylvia Sarah Linton; Miss Elsie Dorothea I. Murray; Capt. W. J. Norman; Fred Bury Osborne, M.A.; Brig.-Gen. Ernest Moncreiff Paul, C.B., C.B.E.; John R. Rymill; Robert R. Rymill; James Salter; Gwilym Emlyn Thomas, M.A.; Benjamin Walker, A.R.I.B.A.; Albert Whiteside.

PAPER: The Shaksgam Expedition. Major K. Mason.

Seventh Evening Meeting, 7 February 1927.—The President in the Chair.

ELECTIONS.—Hubert Stewart Banner, B.A.; Arthur Barrett, J.P.; Miss Louie M. Brooks; Charles E. Glogau; Masauji Hachisuka; Harry Fitz-Gerald Harlock; Dr. Lee S. Huizenga; David Morgan Jenkins; Capt. Gerald Lowry; William McClymont; Percy W. May; Sir John Robert O'Connell, LL.D., M.A.; Percy White Stevens; Mrs. Diana D. Tahourdin; Alexander A. Thomson, B.SC., A.R.S.M.

PAPER: The Didinga Mountains. Mr. J. H. Driberg.

Fourth Afternoon Meeting, 14 February 1927.—Sir Percy Cox, Vice-President, in the Chair.

PAPER: The Landfall of Columbus. Lieut.-Commdr. R. T. Gould.